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Manual Part #Z0360
Published July 1978

RAMP/PROCESSOR
INSTALLATION, OPERATION AND
MAINTENANCE MANUAL

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15 DE ANGELO DRIVE
BEDFORD, MASSACHUSETTS 01730 USA
TELEPHONE: (617) 275-0300
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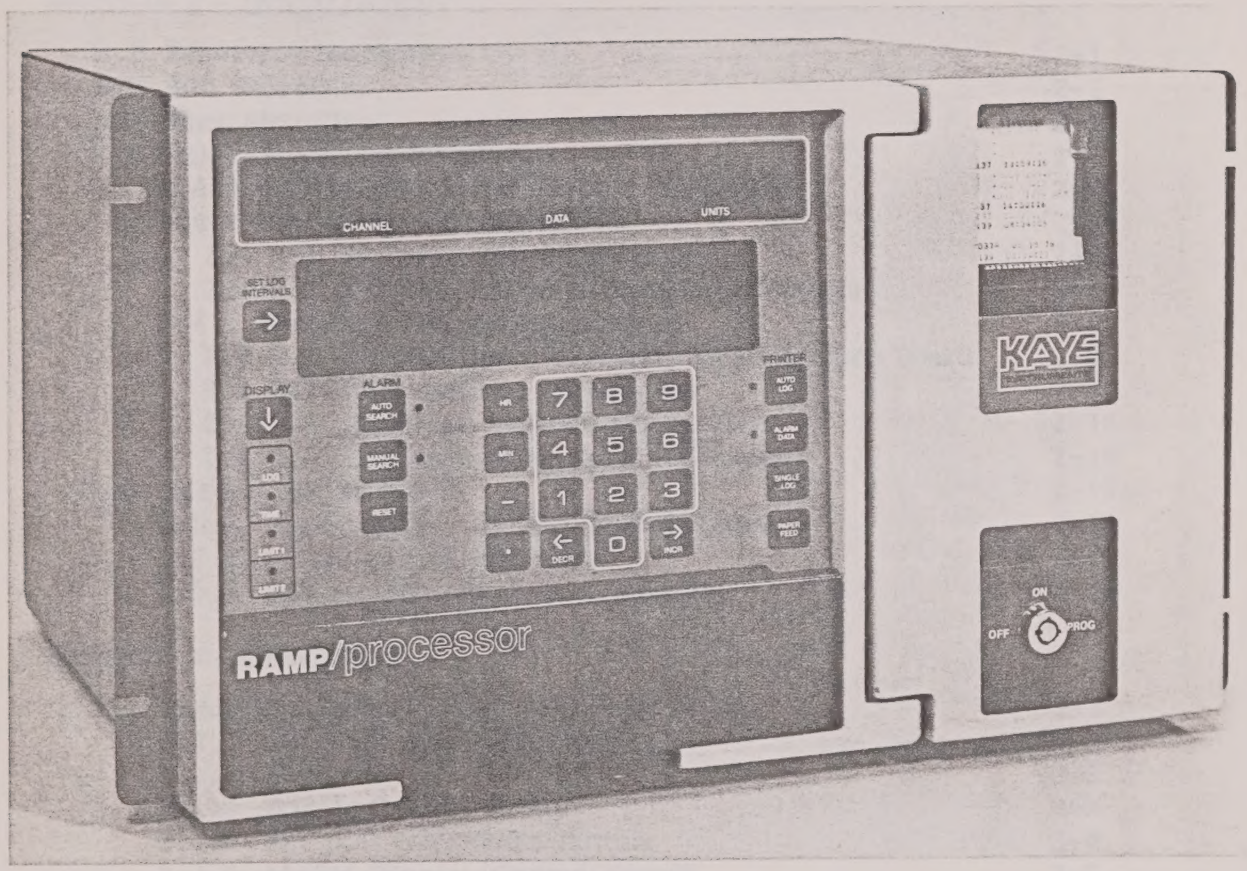
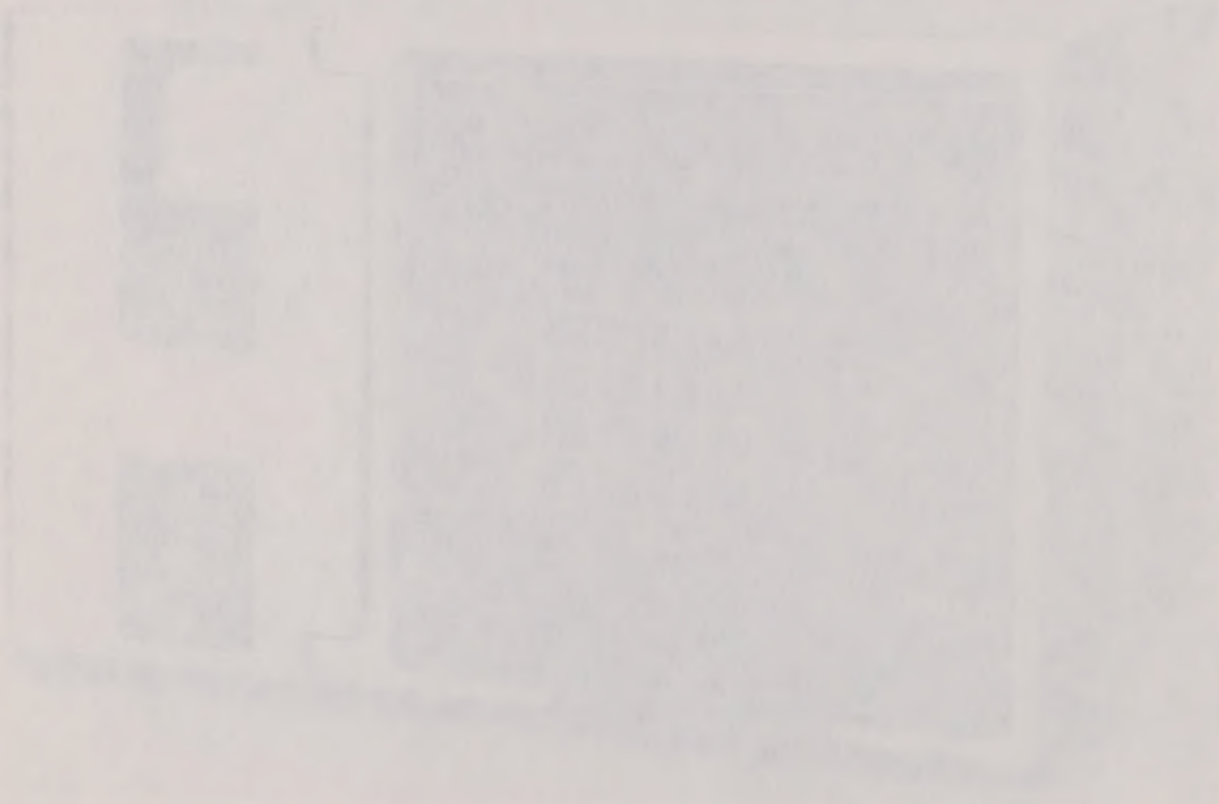


RAMP/PROCESSOR



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A	RAMP/Data Logger Check List
B	Eight-Bit ASCII Characters
C	RAMP/Processor Schematics

SECTION 1 - INTRODUCTION

1.1 General Description

RAMP is Kaye Instruments' acronym for Remote Analog Multiplexing Processor. The RAMP/Processor is the control and data reduction member of the RAMP family of data acquisition products. The other two members, the RAMP/Scanner and RAMP/Display unit, provide the data gathering and remote display capabilities for the product line.

The RAMP/Processor receives and processes digital data signals from a maximum of eight local or remote RAMP/Scanners at a rate up to 160 channels per second. This data is converted to engineering units, compared with alarm limits and used to update the RAMP/Processor's memory. Alarm data are automatically posted on the front panel display and alarm relay contacts are activated by the unit.

The RAMP/Processor may be used as a stand-alone data logger, using its self-contained printer to print data at specified intervals. It may also be used to concentrate raw data from RAMP/Scanners for use by a computer, when fitted with the optional auxiliary I/O interface.

The RAMP/Display unit may be used in conjunction with the RAMP/Processor as a remote display of processed data for any channel. In addition, it may be used to search out and display alarm data.

This manual is intended to serve as a guide to the proper installation, operation and maintenance of this precision instrument. A thorough review of the material in this manual prior to installation or operation of your RAMP system will insure high quality data retrieval.

1.2 Specifications

Dimensions:	17-3/8" wide x 10-17/16" high x 15" deep (44.1 cm x 26.5 cm x 35.8 cm) Mounting hardware is compatible with standard 19" wide enclosures
Weight:	40 pounds (18.2 kg)
Power:	110 V ±10%, 60 Hz Optional 220 or 240 V ±10%, 50 Hz 50-100 watts, depending on configuration
Fuse:	1A 3AG Slo Blo .5A Slo Blo for 220/250 V, 50 Hz
Ambient Temperature:	32°F to 113°F (0-45°C) 0-95% (non-condensing) relative humidity
Channel Capacity:	64 in basic form with all features supported, 640 maximum with optional level II Memory and Scanner I/O. See Table 1-1.

Specifications (cont'd.)

Maximum Scan Rate:	160 channels/second, independent of printer speed, at system capacity
Printer Speed:	2.5 channels/second, independent of scan rate
Printer Record Capacity:	6000 channels/100 ft. tape
Log Intervals:	1 minute to 99 hours (7.5 seconds if set to zero)
Skip Channel Functions:	Individual for every channel
Channel Tagline:	Independently set for every channel
Assignable Limits:	Two per channel, independently set for every channel
Limit Types:	High, Low, Rate of Change
Relay Closures:	Two; independently assignable for each limit. Optional relay closures to expand capacity to 96, independently assignable.
Closure Configurations:	Normally open or normally closed
Relay Contact Capacity:	2A at 115 VAC Resistive
Standard Scaling Functions:	
Voltage:	Auto range, 4 V, 20 V
Platinum RTD:	100Ω at 1 ma current 100Ω in bridge configuration
Thermocouples:	E, J, K, R, S, T; °C or °F
User Programmable Functions:	35 Linear Functions 18 Accumulation Functions
Assignable Accumulation Channels:	64, independently assignable
Computer Interface:	Via optional I/O Board RS232C, 20 ma TTY, 8 bit parallel

1.3 Warranty

The RAMP/Processor is warranteed for one year from the date of shipment. This warranty includes the cost of both parts and labor and will be honored at the factory Service Department in Bedford, MA. If the failure has been caused by misuse, operation in excess of specification, or modifications by the customer, the warranty will be VOID and repairs will be billed at standard rates. In such cases, an estimate will be submitted before work is started.

Instruments returned to the factory for repair must have shipping charges prepaid and must be accompanied by documentation explaining the reason for return. Please obtain return authorization from the factory Service Department prior to shipping an instrument to the factory for repair.

Kaye Instruments reserves the right to make changes or improvements in its products without incurring any obligation with respect to products previously manufactured.

This warranty is in lieu of all other obligations, expressed or implied.

Table 1-1 Required Memory Level

Basic Channel Capacity	Neither Alarm nor Channel Identification Features Used	Channel Identification but not Alarm Feature Used	Alarm but not Channel Identification Feature Used	Both Alarm and Channel Identification Features Used
64	LEVEL I MEMORY (standard)			
128				
192			LEVEL II MEMORY (Model ME-3)	
256				
320	LEVEL II MEMORY (Model ME-3)			
384				
448				
512				
576				
640				

NOTE: Scanner I/O Level II must be used if more than two RAMP/Scanners are connected to the RAMP/Processor. Scanner I/O level may be changed at any time.

Alarm and channel identification features are selected or delected at the time of RAMP/Processor initialization. See Section 2.5 for details of initialization procedure.

SECTION 2 - INSTALLATION

2.1 Receiving Inspection

When the RAMP/Processor is received, the shipping containers should be inspected for possible transit damage. Any exterior container damage should be noted on the agent's shipping documents. If shipping container damage is noted, the equipment should be checked out and, if necessary, a claim should be filed with the agent.

If the shipping container is received in an undamaged condition, yet inspection of the RAMP/Processor reveals damage, contact Kaye Instruments.

A check of equipment received should match items on the packing slip. Options such as Level II Memory will be installed and not packed separately. Report any shortages to Kaye Instruments.

2.2 Site Selection

The RAMP/Processor should be located where its capabilities for scaling, consolidating and displaying data can best be used. Generally, this will be in a control room environment, but may involve location in production line environments.

Site considerations are similar to those required by most electronic instrumentation, ie. free from excessive moisture, dust or other contaminants. Temperature variations should be examined as extreme temperatures can affect the accuracy and reliability of the instrument. Availability of properly grounded AC power is an obvious requirement. If the RAMP/Processor is to be used with an external computer, an appropriate interface must be available.

2.3 Rack Mounting

In a typical installation, the RAMP/Processor will be located in an EIA standard 19" wide cabinet, alone or with other electronic equipment. The RAMP/Processor can also be used in bench top applications. The rack mounting brackets and mounting screws are packed with each RAMP/Processor. The rubber feet may be removed to facilitate rack mounting. Refer to Figure 2-1 for complete mounting dimensions.

> The AC power cord is attached to the rear panel connector, and must be connected to a properly grounded receptacle only.

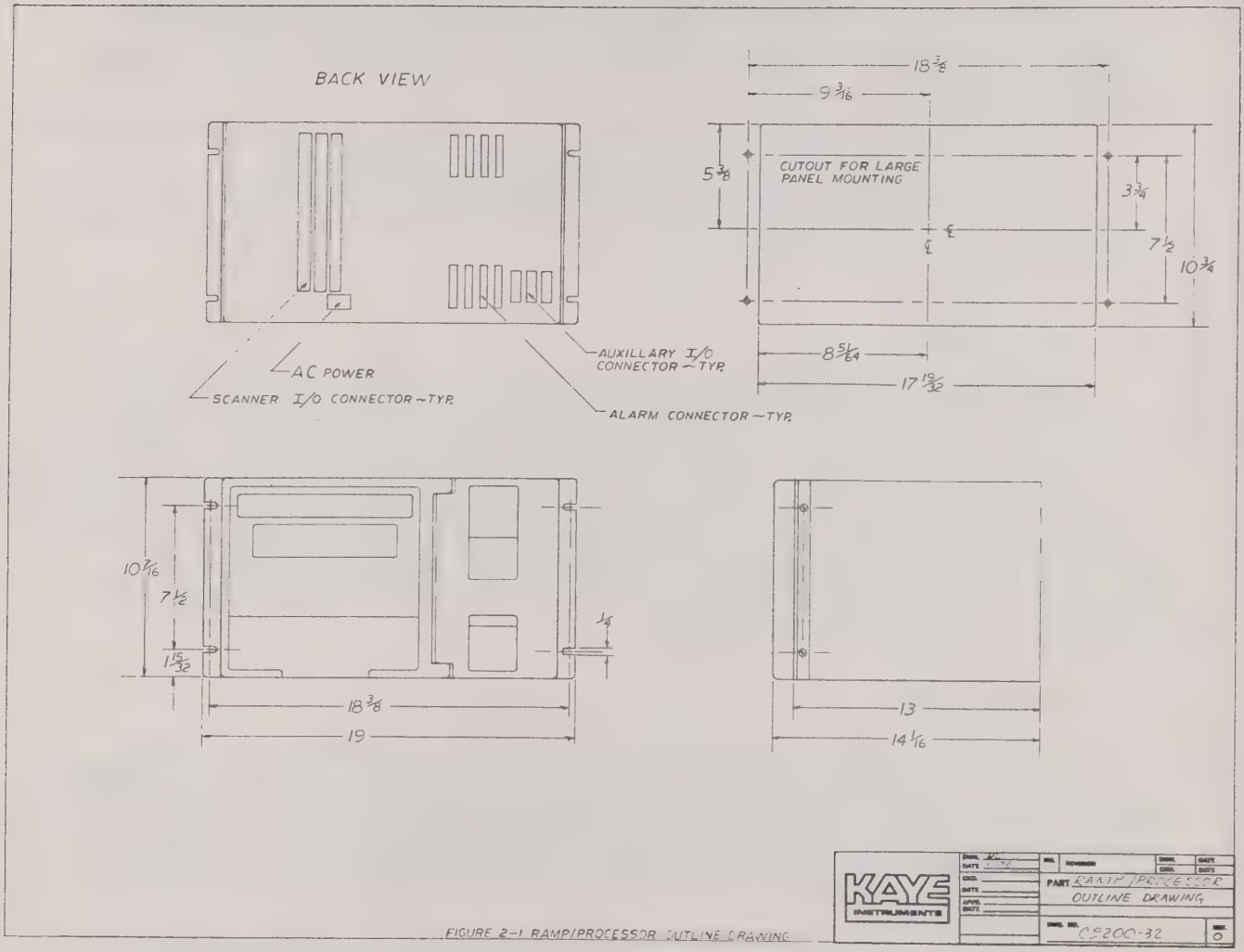


FIGURE 2-1 RAMP/PROCESSOR OUTLINE DRAWING

Figure 2-1 RAMP/Processor Outline Drawing

2.4 RAMP/Processor Interfaces

In many data logging applications, the RAMP/Processor will perform the scaling, engineering units conversion, averaging and alarming as a stand alone unit. In addition, the RAMP/Processor has the capability to direct processed digital data to a computer when more complex functions are required.

In the following figures, a few of the many possible configurations for a RAMP/Processor, RAMP/Scanner and a computer are illustrated.

Figure 2-2 depicts a 192-channel distributed data logging system formed by connecting each of three RAMP/Scanners to a RAMP/Processor via dual twisted pair cables.

Processed data is automatically printed on the built-in RAMP/Processor printer.

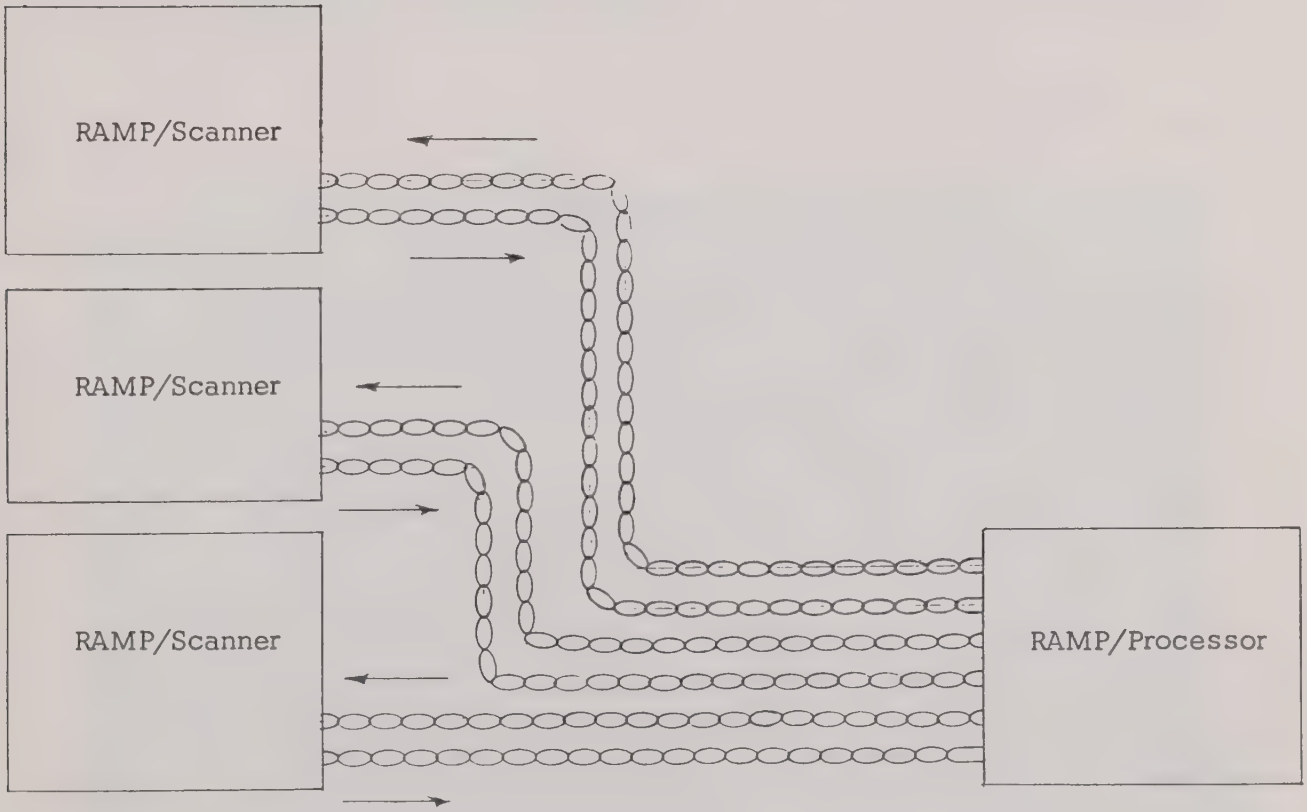


Figure 2-2 RAMP/Data Logger

In Figure 2-3, a 192-channel distributed data logger has been slaved to a minicomputer via a dual twisted pair cable. The minicomputer receives pre-processed data from the RAMP/Processor and is capable of outputting computer finished reports on a printer/plotter from instructions entered via the terminal. Thus, progress of an experiment may be reviewed quickly via a CRT display.

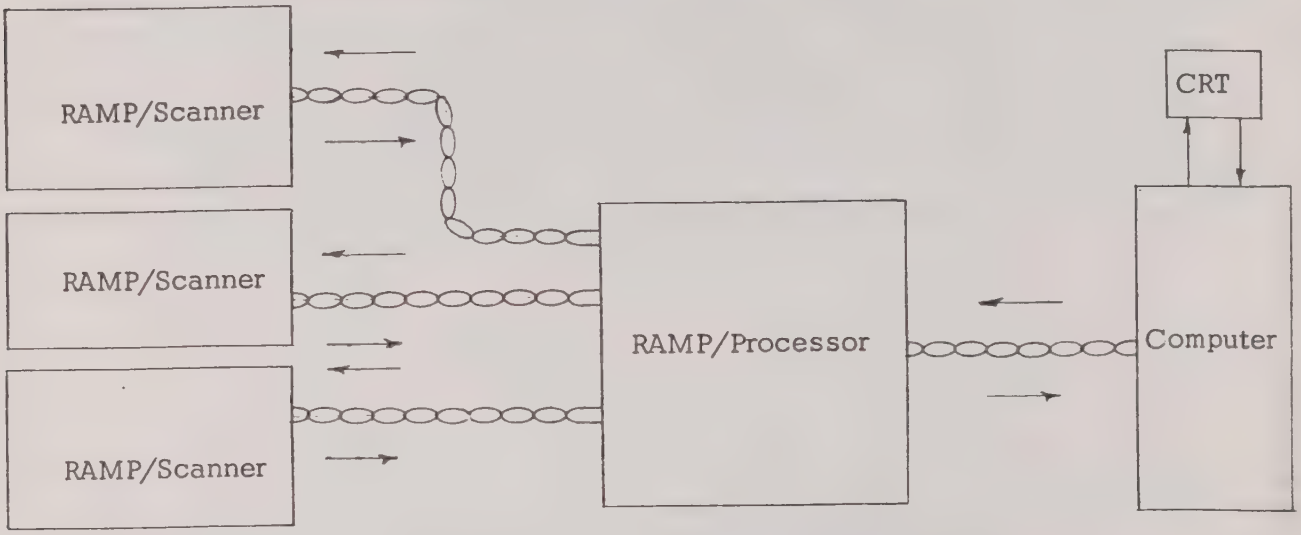


Figure 2-3 RAMP/Data Processor

Figure 2-4 illustrates a RAMP/Processor and RAMP/Scanner connected for recording up to 64 inputs. In addition to the RAMP/Processor display and printout, this system includes a remote RAMP/Display which can display the data from any channel in addition to indicating and displaying alarm data.

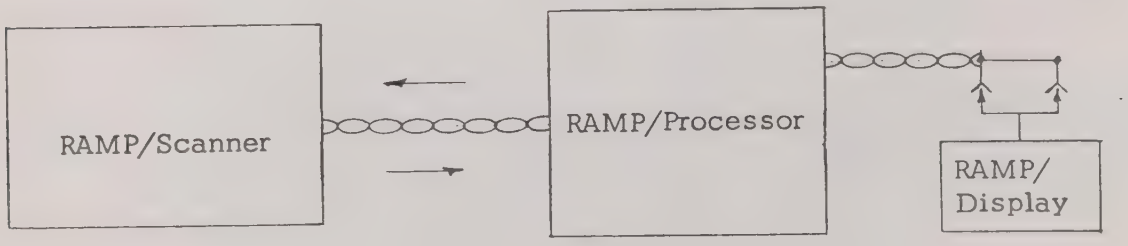


Figure 2-4 RAMP/Data Logger with Remote Display

2.4.1 RAMP/Scanner Interface Connections

To connect a RAMP/Processor to a RAMP/Scanner, the following steps must be performed.

1. Install a suitable dual twisted pair shielded cable such as Model SPC-6 between the RAMP/Processor and the RAMP/Scanner.
2. Connect one end of this cable to the labeled screw terminals on the rear of the RAMP/Processor. See Figure 2-5 for wiring connections. Be sure to connect the shield to the ground connections provided on the rear panel.
3. Connect the remaining free end of the interconnecting cable to the passive current loop section of the RAMP/Scanner Computer I/O connector. If the Model SPC-6 cable is not used, a Cinch DA-15P connector, or equivalent, may be wired as shown in Figure 2-6.

The RAMP/Scanner's Computer I/O connector provides a passive current loop connection, requiring that the necessary 20 ma current be supplied by the unit to which it is connected.

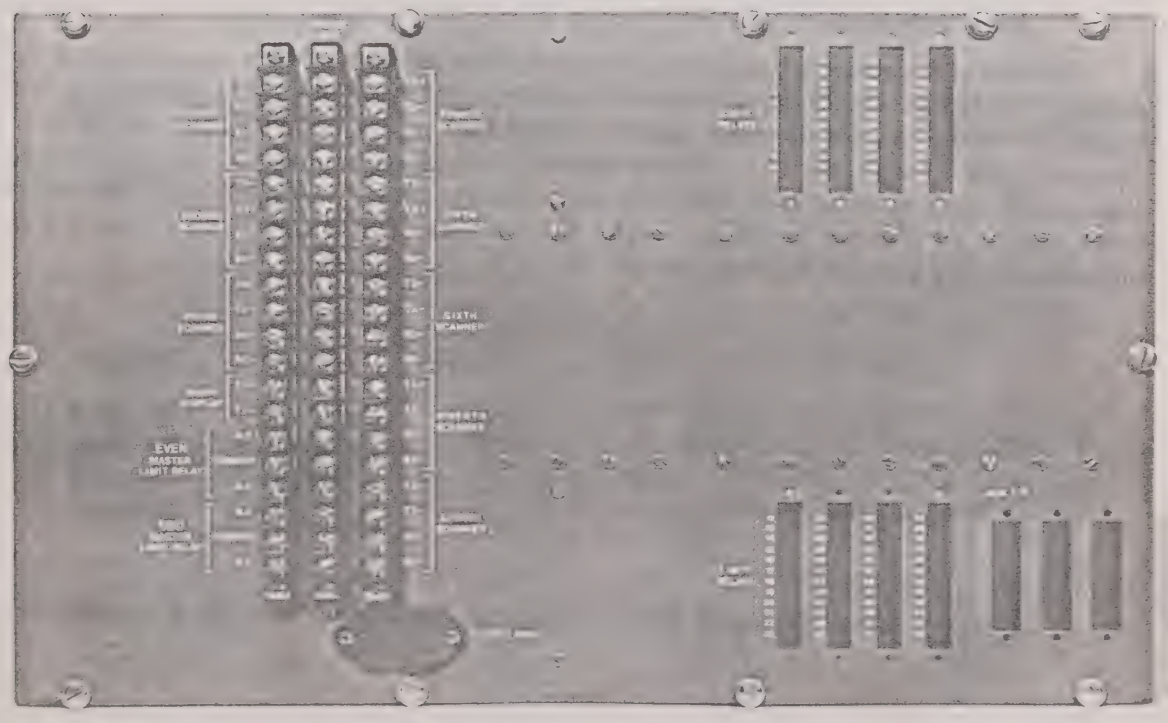
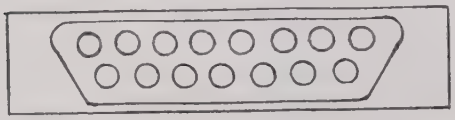


Figure 2-5 RAMP/Processor Rear Panel

Each RAMP/Scanner being connected to the RAMP/Processor must be checked to ensure that the data format and transmissions from it are compatible with the RAMP/Processor and any other RAMP/Scanners in use with it. The general procedure is outlined below; specific information for each step may be found in the RAMP/Scanner manual in the indicated sections. A complete set-up check list may be found in Appendix A of this manual.

1. Set the DIP switch on each eight channel plug-in according to Section 3.6 of the RAMP/Scanner manual.
2. Set the DIP switch located on the Inguard Logic board according to Section 3.7 of the RAMP/Scanner manual. These steps identify for the RAMP/Processor the block and channel numbers for each RAMP/Scanner. The channel numbering scheme for the RAMP system is arranged in 64 channel blocks. Up to ten blocks may be connected, for a total of 640 channels. An address consists of a three digit number; the first digit indentifies the block, and the second two digits specify one of the 64 channels in that block. Thus, channel 631 represents channel 31 in block 6.
3. Set the data transmission (baud) rate selector at 2400 as described in Section 3.7.2 of the RAMP/Scanner manual.
4. Check that the key switches on all RAMP/Scanners connected to the RAMP/Processor are in the ON LINE position. Data will not be transmitted to the RAMP/Processor from a RAMP/Scanner if its key switch is in the OFF or OFF LINE position.

The RAMP/Scanners transmit data according to one of eight assignable operating modes. These are fully described in the RAMP/Scanner manual, Section 3.9. The RAMP/Processor automatically sends a command to all RAMP/Scanners once a minute, placing them in mode 0. This mode causes a RAMP/Scanner to begin scanning at channel 00, and to scan and transmit data continuously. Any RAMP/Scanner which has been placed in another operating mode by the use of a RAMP/Display with it will automatically be reset by this command.



Pin #	Signal	Origin
1	+Receive	External
2	-Receive	External
3	+Transmit	Internal
4	-Transmit	Internal

Figure 2-6 RAMP/Scanner Interface Cable Connector Pin Assignments

2.4.2 Alarm Relay Connections

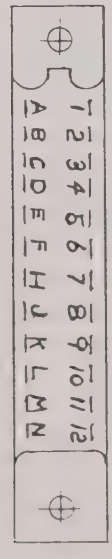
2.4.2.1 Standard Relay Closures

The RAMP/Processor is supplied with two single pole double throw relay closures. Alarm relay connections are made at the screw terminals on the rear of the RAMP/Processor, as shown in Figure 2-5. The terminals are labeled for the contact configurations in a de-energized state. If the RAMP/Processor is initialized for an energized (normally closed) contact configuration, the normally open terminal pair will be closed, and vice versa. The standard relays are designated the Even and Odd relays, and are controlled by the relay numbers assigned to channel limits. The Even relay will be activated any time a limit with an even numbered relay is tripped, and likewise, the Odd relay will be activated any time an odd numbered relay is called. These may be used as master alarm relays in conjunctions with the optional relay boards, to indicate an alarm condition of a general type or in a general area.

2.4.2.2 Optional Alarm Relay Circuit Boards

Up to 4 optional 24 alarm relay circuit boards, Model RY-24, can be installed in the RAMP/Processor mainframe to provide addressable relay closures. All relays can be connected for either normally-open or normally-closed operation.

The contact configuration is chosen for all optional relays at the time the RAMP/Processor is initialized. Section 2.5 describes the procedure. Each relay board address is set using DIP switch S1, located on each RY-24 board. Table 2-1 shows the proper switch settings. Connections to each optional alarm relay board are made using the two Cinch 251-12-30-160 connectors, or equivalent, supplied with each RY-24 board. Figure 2-7 shows the connector pin assignments. The connectors are secured to the rear of the RAMP/Processor using the screws provided.



Contacts	Relay Number	
Pin Pair	Upper Connector	Lower Connector
1,A	00	12
2,B	01	13
3,C	02	14
4,D	03	15
5,E	04	16
6,F	05	17
7,H	06	18
8,J	07	19
9,K	08	20
10,L	09	21
11,M	10	22
12,N	11	23

Figure 2-7 Optional Alarm Relay Connector Pin Assignments

Table 2-1 RY-24 Address Switch Settings

Switch Position			First Relay Address
3	2	1	
			00
°			24
	°		48
°	°		72

NOTE: Dot (°) indicates ON position

2.4.3 Auxiliary I/O Interface Board

2.4.3.1 Introduction - Auxiliary I/O Interface Board

The auxiliary I/O interface board allows transfer of processed data from the RAMP/Processor to an external recording device or to a computer for further processing. The auxiliary I/O board may be ordered using one of three model numbers, which specify the type of interface cable supplied with the board. Models RS-1F and RS-2M are supplied with EIA specification RS232C female and male connectors, respectively. The female interface connector is used with terminal devices, while the male is used to connect with a communications device or modem. The CL-3T interface is intended for passive current loop applications. The auxiliary I/O board is designed so that it may be made compatible with a wide range of external devices by means of setting the six ten-position DIP switches located on the board. Data transmission from the auxiliary I/O board may be serial by bit in RS232C or passive current loop output, or may be serial by character for punched paper tape and magnetic tape recording. Figure 2-8 shows connector pin assignments for the different outputs. The output code used is a subset of standard ASCII. Appendix B lists the ASCII code subset that is normally furnished with the RAMP/Processor.

The auxiliary I/O board may be divided into two sectors; the User Defined Parameters, selected by DIP switches S1-S3, and the Hardware Defined Parameters, selected by DIP switches S4-S6. The following sections explain the function of each DIP switch.

Pin No.	RS232C	Passive	Parallel	Voltage
1				+15V
2	Transmit (I)			
3	Receive (E)			
4		+ Transmit (I)		
5		- Transmit (I)		
6				+5V
7	GND	GND	GND	GND
8				-15V
9		+Receive (E)		
10		-Receive (E)		
11			Data Bit 7 (I)	
12			Data Bit 6 (I)	
13			Data Bit 5 (I)	
14			Data Bit 4 (I)	
15			Data Bit 3 (I)	
16			Data Bit 2 (I)	
17			Data Bit 1 (I)	
18			Data Bit 0 (I)	
19			Data Strobe (I)	
20			EOR (I)	
21			EOF (I)	
22			Ready 1 (E)	
23			Ready 2 (E)	

NOTE: E - External Signal Source I - Internal Signal Source

Figure 2-8 Auxiliary I/O Board Connector Pin Assignments

2.4.3 User Defined Parameters

The user defined parameters, which are selected using DIP switches S1-S3, set the format and type of data output by the auxiliary I/O board. The switch settings program the board when power is supplied to the board.

DIP switch S1 selects what data are to be transmitted, the intervals at which the data are transmitted, and the range of channels from which the data may be selected. Table 2-2 shows the switch positions.

Position 1, Alarm Output, enables transmission of data from any channels which enter or leave an alarm condition, or which trip a rate of change alarm. If the Auto Log Data Output, switch 3, is on, active channels between the "First" and "Last" channels will be transmitted at the specified log interval. If both the Auto Log Data and Alarm Data Outputs are enabled, all active alarm data will be transmitted, in sequence, with Auto Log Data from the "First" to the "Last" channel also included in order. Alarm data will be accompanied by an "A" character, to indicate its alarm state. Accumulation Output, activated by switch 2, allows transmission of accumulation totals at the end of each accumulation period.

Position 5, the Expanded Log Channel Range, controls the number of channels available to the auxiliary I/O board for transmission. In its "off" position, this feature is deleted, and the Auto Log Data are selected from the non-skipped channels bounded by the "First" and "Last" channel settings made from the front panel. When selected, the Expanded Log Channel Range permits Auto Log Data from all non-skipped channels to be selected, without "First" and "Last" channel bounds. The time interval between scheduled data transmissions is controlled by the Independent Log Time

Interval. Unless enabled by turning position 4 on, time intervals will be those set by the front panel Set Log Intervals control. When enabled, the Independent Log Time Interval overrides the front panel, and causes data transmissions at the interval set using DIP switch S3. Regular printout intervals are not affected by this switch.

Switch 8 inserts a "Rubout" character after each Carriage Return/Line Feed command. This may be used to provide additional time after a CR-LF command for the device to ready itself for the next line of data. When selected, position 7, the Interactive Computer Control, allows a remote computer to transmit a "Ready" character which will enable output transmission. The RAMP/Processor will respond by transmitting the requested information and will then await further instructions. This feature permits the RAMP/Processor to be used with computers or calculators with limited data handling or storage capacity.

Switch 9, Single Log Enable, causes the on-board printer to print at the Independent Log Time Interval set using DIP switch S3, if both it and switch 4, Independent Log Time Interval, are on. The printer will also print at the log interval set using the Set Log Interval button, as described in Section 3.1.4 of this manual.

An external computer may request any or all of the features selected using positions 1-5 of DIP switch S1. This is done by transmitting a command character consisting of six significant bit locations. The least significant bit corresponds to switch position 1; the most significant bit is used as a "start scan" command. Table 2-2A lists the basic commands, which may be combined. The "start scan" command functions in the same manner as the "single log" control button. Selection of this feature does not prevent data transmission scheduled by the RAMP/Processor.

Table 2-2 Auxiliary I/O Board DIP Switch S1

Switch Position	Output Configuration
1	Alarm Output
2	Accumulation Output
3	Auto Log Data Output
4	Independent Log Time Interval
5	Expanded Log Channel Range
6	Not Used
7	Interactive Computer Control
8	Rubout with Each CR-LF
9	Single Log Enable
10	Not Used

NOTES: "ON" selects each listed item.
Independent time interval value set using DIP switch S3.
Interactive computer control allows a remote computer to initiate a data log at any time. The character transmitted determines what data are to be sent.

Table 2-2A Command Characters

Character	"Enable" Command
0000001	Alarm Output
0000010	Accumulation Output
0000100	Auto Log Data Output
0001000	Independent Time
0010000	Expanded Range
1000000	Start Scan

NOTE: Commands may be combined to select more than one feature at a time. "Start Scan" will initiate a single scan.

DIP switch S2 provides formatting information as well as selection or deletion of run number, fixed ID, channel ID, or units transmission. The day, hours, minutes and seconds, and channel number will always be transmitted whenever data are output. Switch positions 5 and 6, and 7-9 determine how many character spaces are between data points, and the number of additional data points on each line. Table 2-3 shows the switch assignments.

Table 2-3 Auxiliary I/O Board DIP Switch S2

Switch Position	Format Selected
1	Run Number
2	Fixed ID
3	Channel ID
4	Units
5	2 Spaces Between Data Points
6	1 Space Between Data Points
7	4 Additional Data Points Per Line
8	2 Additional Data Points Per Line
9	1 Additional Data Points Per LIne
10	Not Used

NOTES: "ON" selects each format parameter
Switch positions 5 and 6 are additive. Range is 0 to 3.
Switch positions 7-9 are additive. Range is 0 to 7.

The log intervals for the auxiliary I/O may be either the same as the printer interval or may be set at any other interval. Position 5 of DIP switch S1 enables the settings of DIP switch S3. Positions 1-4 and 5-8 are set to provide the BCD representation of the interval, in the range 00 to 99. Position 9 is used to select hours or minutes. An independent log time interval of 45 minutes would be set by turning positions 2,6 and 8 on; an interval of 38 hours would be set by turning on positions 3,4,5 and 9. Table 2-4 shows the switch assignments for DIP switch S3.

Position 10 of DIP switch S3 may be used in conjunction with position 10 of DIP switch S4 to select a line or character block length count. In its ON position, switch 10 of DIP switch S3 selects a format in which the block length is a specified number of lines of output. The OFF position selects a character count. Block length is specified using DIP switch S6. The counter is enabled using position 10 of DIP switch S4, the Block Length Counter Enable switch.

Table 2-4 Auxiliary I/O Board DIP Switch S3

Switch Position	Selected Value
1	80
2	40
3	20
4	10
5	8
6	4
7	2
8	1
9	Hours/Minutes (Hours selected by "ON")
10	End of Record Select

NOTES: "ON" selects each listed format
Positions 1-4 are additive. Allowable range is 00-90.
Positions 5-8 are additive. Allowable range is 0-9.
Position 10 selects line count format for DIP switch S6 when "ON".
"OFF" = characters.

2.4.3.3 Hardware Defined Parameters

The settings of DIP switches S4-S6 are used to tailor the output from the auxiliary I/O board to the electrical and logical requirements of the associated output device. When the auxiliary I/O board is supplied with a standard Kaye Instruments RAMP/Processor peripheral device, the switches will be set as shown in Table 2-8. When these switches are preset by Kaye Instruments, they should not be altered. The only settings which may be changed are the baud rate and block length.

The data transmission, or baud rate is set using switch positions 1-3 of DIP switch S4. The eight available baud rates and their corresponding switch positions are shown in Table 2-5A. Table 2-5B details the settings of switches 4-7 to select one of sixteen different output strobe pulse widths. Switches 7 and 8 enable the output and input respectively, of serial data streams. In their OFF positions, these

switches select an eight bit parallel data format, most often used with paper tape punches and magnetic tape drives. Switch position 10 enables or deletes an internal block length counter. This feature will be selected if the magnetic recording device used in conjunction with the RAMP/Processor has no block length counter of its own. Table 2-5 lists the switch positions and their assignments.

DIP switch S5 (Table 2-6) is used to select the polarity and parity of the transmitted data. The polarity is reversed by inverting the signal through the use of an exclusive or gate in the auxiliary I/O board logic. Positions 3 and 4 are selected when a device such as a magnetic tape unit is used which produces both a "Ready" and "Write Ready" signal. Switch 7 is used to select or delete the parity bit. Switch 8 selects the stop bit, and switches 9 and 10 are used to select the data word length used by the external computer. Table 2-6A details the proper settings for switches 9 and 10 for each word length. Switches 6-10 must be properly set for operation with a Universal Asynchronous Receiver-Transmitter (UART). Table 2-8 details the proper switch settings for this case.

If the internal block length counter was selected using switch 10 of DIP switch S4, the block length must be set using DIP switch S6. The range of values is 2-2046, selected by turning on from one to ten of the switch positions. Table 2-7 shows the switch assignments, which are additive when turned ON.

Table 2-5 Auxiliary I/O Board DIP Switch S4

Switch Position	Hardware Configuration
1	4 Baud Rate Bits
2	2 Baud Rate Bits
3	1 Baud Rate Bit
4	8 Output Strobe Pulse Width Bits
5	4 Output Strobe Pulse Width Bits
6	2 Output Strobe Pulse Width Bits
7	1 Output Strobe Pulse Width Bit
8	Serial Data Output Enable
9	Serial Data Input Enable
10	Block Length Counter Enable

NOTES: Positions 1-10 are selected by "ON" position.
Table 2-5A shows switch positions for baud rate selection.
Table 2-5B shows switch positions for pulse width selection.

Table 2-5A Baud Rate

Positions			Baud Rate
1	2	3	
			110
		°	150
	°		300
	°	°	600
°			1200
°		°	2400
°	°		4800
°	°	°	9600

NOTE: Dot (°) = ON

Table 2-5B Strobe Pulse Width

Positions				Pulse Width
4	5	6	7	
			°	2μ Sec
		°		5μ Sec
		°	°	10μ Sec
	°			20μ Sec
	°		°	50μ Sec
	°	°		100μ Sec
	°	°	°	200μ Sec
°				500μ Sec
°			°	2m Sec
°		°		5m Sec
°		°	°	10m Sec
°	°			20m Sec
°	°		°	50m Sec
°	°	°		Not Used
°	°	°	°	Not Used

NOTE: Dot (°) = ON

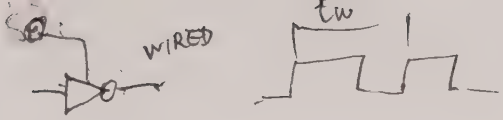


Table 2-6 Auxiliary I/O Board DIP Switch S5

Switch Position	Hardware Configuration
1	Output Data Polarity
2	Output Strobe Polarity
3	Device Ready Input Polarity
4	Device Ready Input Polarity
5	End of Record/End of File Polarity
6	Even/Odd Parity on Data
7	Parity Enable
8	Stop Bit
9	Data Word Length Select
10	Data Word Length Select

NOTES: "ON" position selects Logical 1 = Low for switch positions 1,2
"ON" position selects High = "Ready" for switch positions 3,4
"ON" position selects Logical 1 = Low for switch position 5
"ON" position for switch 6 selects even parity
"ON" position for switch 7 enables parity checking bit
"ON" position for switch 8 selects 1 bit, "OFF" selects 2 bits

Table 2-6A Word Length Selection

Switch Position		Word Length
9	10	
		8
	°	7
°		6
°	°	5

NOTE: Dot (°) = ON

Table 2-7 Auxiliary I/O Board DIP Switch S6

Switch Position	Binary Coded Block Length
1	512
2	256
3	128
4	64
5	32
6	16
7	8
8	4
9	2
10	1

NOTES: "ON" position selects each value.
Positions are additive. Allowable range is 1-1023.
DIP switch S6 is activated by position 10 of DIP switch S4.
Position 10 of DIP switch S3 selects line or character counting.

Table 2-8 Recommended Switch Settings for RAMP/Peripherals

DIP Switch No.	DIP Switch Position	Facit 4070 Tape Punch	MFE 5000 Cassette Recorder	Kennedy 9-track Tape Recorder	Kennedy 7-track Tape Recorder	UART
S4	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
S5	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
S6	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					

NOTE: Dot (°) indicates ON for indicated DIP switch position.
Asterisk (*) indicates user may alter switch setting.

(Information not available at publication date)

2.4.3.4 Examples of Serial Data Formats

Following are several examples of serial data formats set using DIP switches S1 and S2. Refer to Table 2-9 for a list of characters and their meanings.

The output when DIP switch S1 positions 1-4 and 7, and S2 positions 1-4, 6 and 9 are on is as follows:

RRR∅FFFFFFFF∅CR∅LF∅■DAY∅HH:MM:SS∅CR∅LF∅■AXXX

ANNN∅DDDDDD∅AAA∅AXXX∅NNN-DDDDDD∅AAA∅AXXX∅NNN∅DDDDDD∅

AAA∅CR∅LF∅■, etc.

If S1 positions 4 and 5, and S2 positions 5 and 10 are on, independent log time intervals would be selected and the output would be in the following format:

DAY∅∅HH:MM:SS∅∅CR∅∅LF∅∅NNN∅∅DDDDD∅ANNN∅∅DDDDD∅∅CR∅∅LF∅∅

For the case when a channel enters an alarm condition when S1 position 1 and S2 positions 6 and 10 are on, the format is:

DAY∅HH:MM:SS∅CR∅LF > NNN∅DDDDD

Table 2-9 Serial Data Format Characters

Characters	Definition
RRR	Three digit Run Number
FFFFFFFF	Eight digit Fixed ID
DAY	Three digit Day Number
HH:MM:SS	Time
AXXX	Channel ID
NNN	Three digit channel number
∅ or -	Polarity
DDDDD	Data, Including decimal point
AAA	Units
>,<	Entering and Leaving Alarm Condition
A	Alarm Channel
T	Accumulation Total
■ , ∅	Rubout, Blank (data separator)

2.5 System Initialization

2.5.1 Introduction- Initialization

Prior to its first use, the RAMP/Processor must be initialized by the user to specify the number of RAMP/Scanner blocks as well as which features are to be active. It must also be initialized any time the system configuration is changed, such as when RAMP/Scanner blocks are added or deleted.

2.5.2 Initialization Procedure

The RAMP/Processor is initialized by the following procedure:

1. Turn the key switch to the OFF position.
2. Set DIP switch S3 according to Section 2.5.3 to determine the system configuration. Set DIP switch S2 according to Section 2.5.3 to select contact closures on the optional alarm relay boards. DIP switches S2 and S3 are located on the display PCB on the back side of the front panel door.
3. Pull toggle switch S1 and hold it over.
4. Rapidly turn the key switch from the OFF position to the PROGRAM position.
5. Release toggle switch S1 when the front panel display turns off.

The RAMP/Processor may now be programmed as described in Section 3.2.

2.5.3 Setting DIP Switches S2 and S3

Position 5 of DIP switch S2 enables or disables the printout of accumulation totals. The OFF position disables accumulation printouts, while the ON position enables printouts. Accumulation totals are output to the Auxiliary I/O Board (if installed) in either case. Position 6 of DIP switch S2 selects de-energized (normally open) contact positions for all alarm relays in its OFF position. The ON position selects an energized (normally closed) contact configuration for the optional alarm relays, and energizes the Even and Odd Master relays, so that the normally open contacts are closed, and vice versa.

The channel numbers in the RAMP/Processor are organized in 64 channel blocks. Each RAMP/Scanner unit is equivalent to one or two blocks, depending on whether the RAMP/Scanner is a 64 or 128 channel unit.

The total number of blocks is selected using positions 7-10 or DIP switch S3 set according to Table 2-10.

Positions 1-6 of DIP switch S3 select the features shown in Table 2-9 when each switch is in the ON position.

Table 2-10 System Configuration Set By DIP Switch S3

Switch	Feature
1	Temperature in °C (otherwise °F)
2	Auxiliary Output Board Installed
3	Accumulation Functions
4	Linear Functions
5	Alarm Limits
6	Channel ID
7	8 RAMP/Scanner Block Inputs
8	4 RAMP/Scanner Block Inputs
9	2 RAMP/Scanner Block Inputs
10	1 RAMP/Scanner Block Input

NOTE: Positions 7-10 are additive, OFF=0. Sum of positions 7-10 may not exceed 10.

3.1 RAMP/Processor Operation in RUN Mode

3.1.1 Introduction - RUN Mode

The RAMP/Processor is placed in the RUN mode of operation by turning the key switch to the ON position. The key can be removed in this position, locking the RAMP/Processor in the RUN mode and thereby preventing unauthorized modification of program contents. All commands entered in the RUN mode are made through the front panel controls active in the RUN mode. These controls are:

1. Keyboard
2. Printer Control Group
3. SET LOG INTERVAL button
4. ALARM Display Control Group
5. DISPLAY Button

Figure 3-1 shows their location on the RAMP/Processor front panel.
The PROGRAM mode buttons (located behind the swing-down door) are not active in the RUN mode. See Section 3.2 for PROGRAM mode operating instructions.

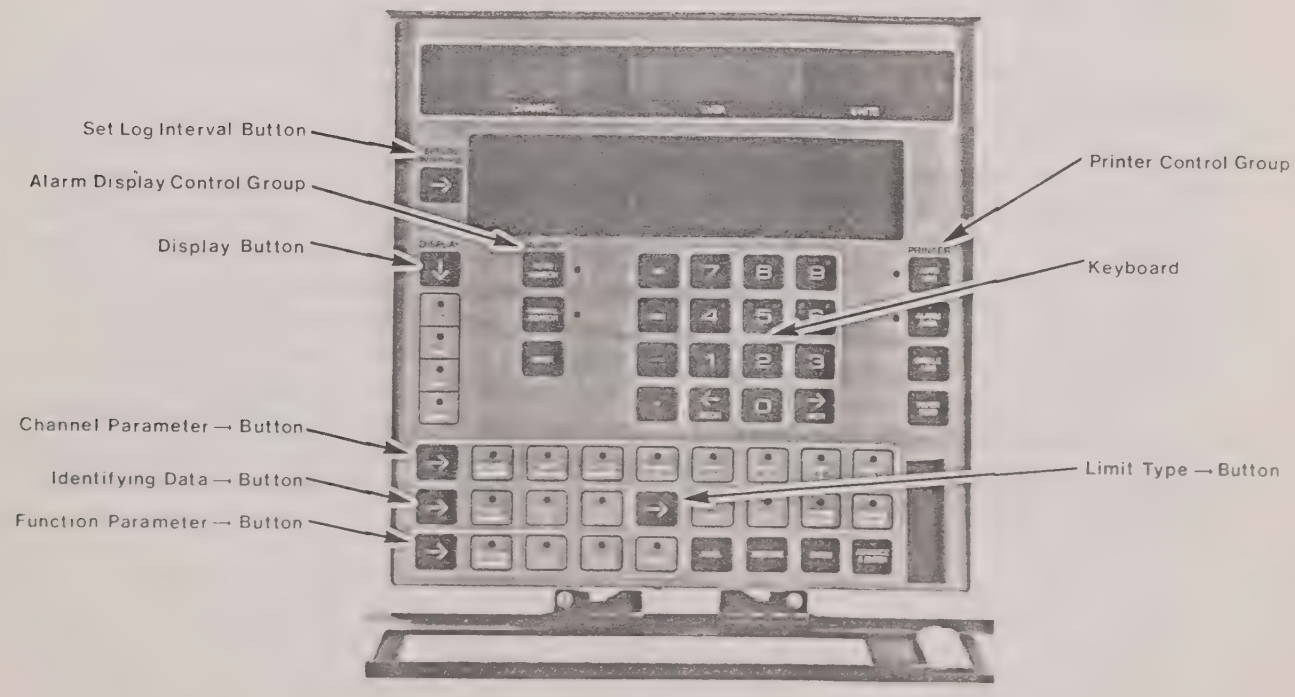


Figure 3-1 RAMP/Processor Control Groups

Valid entries from the front panel are acknowledged by a short "beep" tone. Invalid entries are accompanied by a longer "beep" tone and the INVALID ENTRY indicator. Any valid entry will cancel the previous Invalid Entry condition.

An internal long-life battery sustains the CMOS memory and real-time clock in the event of a power loss for 30 days to a maximum of 10 weeks, limited by battery self-discharge. The CMOS memory contains the programmed instructions and any accumulation channel data present at the time of the failure. When power is returned the printer will print the time of power loss and recovery, and any accumulation totals, which are saved in the CMOS memory.

Any time the RAMP/Processor is turned on using the key switch, or any time power is returned after a power failure, the RAMP/Processor performs a self-test routine. In its self-test, the program contents, CMOS memory, and RAM memory are tested for faults. Any faults are indicated by the display of a message code in the secondary display. Section 6, Troubleshooting, details the error codes and their interpretation.

3.1.2 Keyboard

The keyboard is used for control group data entry and for accessing any valid channel number to view data. Channels may be accessed by entering the valid 3-digit number of the channel to be viewed. Adjacent channels may be observed by pressing the INCR or DECR buttons to increment or decrement the displayed channel number. Repeatedly pressing the INCR or DECR buttons steps the RAMP/Processor through the channel numbers.

3.1.3 Printer Control Group

The printer control group controls the operation of the self-contained printer. Adjacent lamps indicate which printer modes are selected.

Both the Auto Log and Alarm Data buttons are push-on, push-off buttons, and they may be selected singly or together. Selecting the Auto Log mode causes all non-skipped channels between the "First Channel" and "Last Channel" to be printed at the selected "Time Interval" (see Section 3.1.4). When the Auto Log button is pressed, its indicator lamp will light, and a printout will occur at the start of the next minute. Any accumulation totals will also be printed if enabled and the accumulation registers and periods reset to zero. Returning the key switch from PROGRAM mode to RUN mode will also result in a next-minute initialization

If the "Time Interval" is equal to zero, printouts will occur at 7.5 second intervals (or next multiple thereof). The fraction of a minute following the first Auto Log is counted as one minute. Subsequent printouts occur on the minute. During an Auto Log printout, any channel which is in an alarm condition will be printed in red.

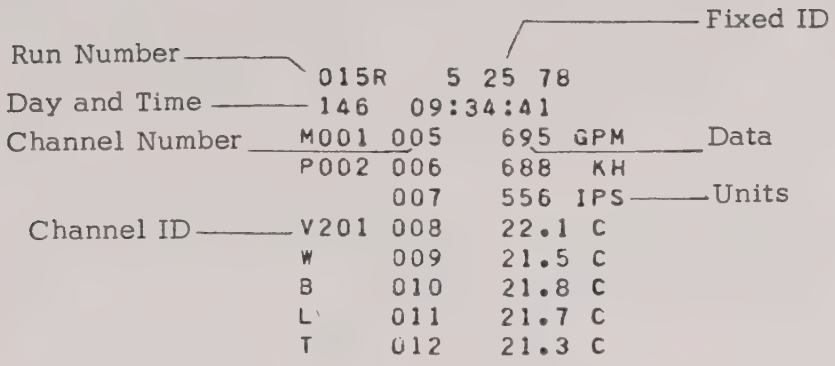


Figure 3-2 Auto Log Printout

When the Alarm Data mode is selected, the printer will record any non-skipped channels which enter or leave an alarm condition, with times for these events. In addition, the Alarm Data mode will cause an alarm summary listing at the specified "Time Interval".

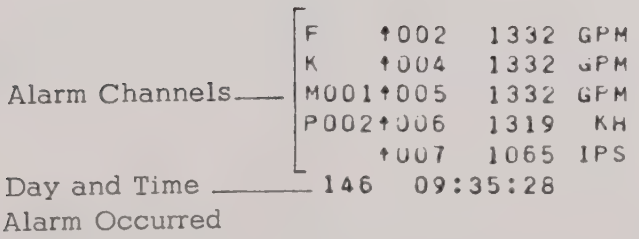


Figure 3-3 Alarm Data Printout

If the Auto Log mode is also selected, the printout sequence is as follows. All non-skipped alarm channels before the assigned "First" channel will be printed in red. Then all non-skipped channels between the assigned "First" and "Last" channels will be printed with alarm data in red. Finally, any non-skipped alarm channels after the "Last" channel will be printed in red.

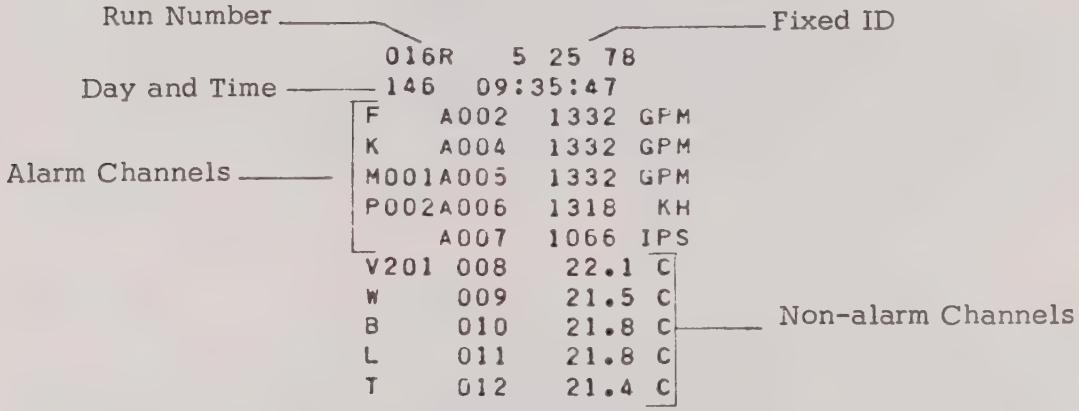


Figure 3-4 Auto Log and Alarm Data Printout

A Single Log is initiated by pressing on the Single Log button. The Single Log functions identically in all respects but one to the Auto Log mode. The only difference is that a single print cycle only is initiated. Use of the Single Log button does not disturb the Auto Log timer.

Pressing the Paper Feed button once causes the printer to advance the paper tape one line. Pressing it twice in rapid succession will result in a multiple line advance. Pressing the button during a rapid paper feed cancels the feed. Pressing the Paper Feed button during an Auto Log or Alarm Data printout aborts the remainder of the printout.

3.1.4 SET LOG INTERVAL Button

When the RAMP/Processor is first placed in the RUN mode with the key switch, the secondary display is blank. Pressing the Set Log Intervals button once causes the secondary display to show three data sets corresponding to the "First Channel", "Last Channel", and "Time Interval". The label "First Channel" will be lit. Pressing the button again will light "Last Channel", then "Time Interval" and finally, all three labels at once.

To select the "First Channel", enter a valid 3-digit number from the keyboard when only the "First Channel" label is lit. Press the Set Log Intervals button to enter the channel number. If the channel number is not valid, a long "beep" tone will sound and the Invalid Entry indicator will light. The channel number will be rejected, and a new number must be entered.

The "Last Channel" number is entered in the same manner. The "Last" Channel" number must be greater than or equal to the "First Channel" value, or it will be rejected.

The "Time Interval" is selected by entering a 2-digit number from the keyboard, followed by pressing the HR or MIN button to specify the interval. The Set Log intervals button must then be pressed to enter the interval.

3.1.5 ALARM Display Control Group

The Auto Search and Manual Search buttons control the displays for alarm channels. Only one button may be selected at a time by pressing the appropriate button. An indicator lamp shows the active button. The Auto Search button will cause the primary display to advance automatically to any non-skipped alarm channel. The "Alarm" and "Alarm Channel" indicators will light, and an audible alarm will sound when any channel enters an alarm condition. Pressing the Reset button will silence the audible alarm, but the indicator lamps will remain on so long as an alarm condition is present. If more than one channel is in an alarm condition, the Auto Search mode will step continuously through all alarm channels at the rate of one channel per second.

The secondary display will automatically show the limit number, limit value, and assigned relay for each displayed alarm channel. If both limit 1 and limit 2 are tripped, only limit 1 will be displayed.

The Manual Search button will cause the primary display to remain on whatever channel is selected, regardless of the condition of any other channel. If an alarm condition is present in the system, the "Alarm" indicator will light.

The secondary display will automatically show the limit information in the same manner as for the Auto Search mode.

Pressing the Manual Search button will advance the displays to the next non-skipped alarm channel, remaining there until the button is pressed again. Repeatedly pressing the Manual Search button allows the operator to inspect a group of alarm channels. The "Alarm Channel" lamp will be lit at any time a displayed channel is in an alarm condition. The current channel address may be incremented or decremented by pressing the INCR or DECR buttons in order to view adjacent channel data. Reset button operation is identical to that for the Auto Search mode.

If no channels are in an alarm condition, pressing either the Auto Search or Manual Search button, followed by a vaild 3-digit number will cause the display of data for that channel. In addition, the INCR and DECR buttons may be used in the Auto Search mode in this case. The reset button also serves to restore the display in the event that it is disturbed by a static discharge.

3.1.6 DISPLAY Button

The Display button controls the secondary display. As the button is repeatedly pressed, the display will cycle through each of four information sets, identified by illuminated labels.

The order of display is as follows:

1. First Channel, Last Channel and Time Interval
2. Day and Time. Days represent the current day of the year. Time is displayed in 24 hour format, and is the current reading from the real-time clock.
3. Limit 1 and Relay 1 values defined for the channel number shown in the primary display.
4. Limit 2 and Relay 2 values defined for the selected channel.

After Limit 2, or after the Day and Time display, if no limits are present, the secondary display will go blank. This is its initial state, from which the cycle may be repeated.

3.2 RAMP/Processor Operation in PROGRAM Mode

3.2.1 Introduction - PROGRAM Mode

The RAMP/Processor is placed in the PROGRAM mode by turning the key switch to the PROGRAM position. All the parameters that define the system's configuration may now be programmed by the user. The programming controls are located behind the swing-down door on the front panel of the RAMP/Processor. See Figure 3-1 for control locations. Before the system is programmed for the first time, it must be initialized according to the instructions found in Section 2.5.

3.2.2 Programming Conventions

No matter what the front panel display may have on it, the data in memory is not changed until the ENTER button is pressed. Nor is the data changed if the INVALID ENTRY indicator comes on when the ENTER button is pressed.

The RESTORE button may be pressed at any time, which will cause the current value of the data in memory to be brought back to the front panel display. In particular, the RESTORE button should be pressed following an INVALID ENTRY in order to make a valid entry.

The NULL button has the effect of setting the display to all "_" symbols. In general, a value of all zeroes or all blanks will be stored when the ENTER button is pressed following a NULL.

The front panel display indicates the number of digits to be entered by means of the "_" symbol. For instance, if the display shows the value "12345" and the "2" button is pressed, the display will show the value "2_ _ _ _", indicating that 4 more digits remain to be entered. If more than 4 more digits are entered, the INVALID ENTRY indicator will be lit. Any "_" symbols which remain when the ENTER button is pressed are automatically replaced with zeroes.

The RAMP/Processor Program Form (Figure 3-5) may be used to list all input channels and their program parameters prior to programming the RAMP/ Processor. The reverse side of each Program Form may be used to summarize linear and accumulation function parameter values. Listing the program ahead of time reduces programming errors and speeds the programming procedure.

3.2.3 Channel Parameters

The Channel Parameter ——> button selects the parameter category to be entered for each channel from the eight categories located across the top row of the programming controls. The Channel Parameter ——> button operates in the same manner as the Display button, cycling through the list one parameter at a time.

When the Channel Parameter ——> button is pressed the first time, the "Channel" display will show "_ _ _". A valid 3-digit channel number must be entered, followed by pressing the "Enter" button. When the Channel Parameter ——> button is pressed again, the display will advance to the next parameter, displaying the current value of that parameter for the displayed channel. Parameters for adjacent channel numbers may be observed by pressing the INCR or DECR buttons as desired. Any parameter may be assigned to a block of channels by making a valid entry for the lowest numbered channel of the block, followed by pressing the Enter button. The parameter is then assigned to the remaining channels by repeatedly pressing the Advance and Enter button.

Programming considerations for each parameter type are discussed in the following sections.

3.2.3.1 Channel Skipped

The Channel Skipped indicator located in the primary display will be lit if the selected channel has been programmed to be skipped. To program a skip, a "1" must be entered from the keyboard; to remove it, a "0" must be entered. A skipped channel will not appear in an Auto or Single Log printout, nor will it cause an alarm condition.

3.2.3.2 Function Number

The selected Function Number determines how the raw data from the RAMP/ Scanner will be converted or scaled by the RAMP/Processor. The user may select from 23 standard functions, 35 linear functions, and 18 accumulation functions. A list of standard functions appears in Table 3-1. Detailed information concerning the linear and accumulation functions may be found in Section 3.2.4 and 3.2.5.

FIGURE 3-4

RAMP/PROCESSOR PROGRAM FORM

BLOCK NUMBER 0 — DATE 7-5-78

FIRST CHANNEL 000 — LAST CHANNEL 015 — LOG INTERVAL 30 ___HR X MIN — FIXED ID 2-4-6-8

CHANNEL ✓		INPUT DESCRIPTION	SKIP	FUNCTION	CHANNEL ID SOURCE CHANNEL	LIMIT 1	RELAY 1	LIMIT 2	RELAY 2
00	32	Millivolt Display (Auto-Range)	0	00	—	—	—	—	—
01	33	4V Range	0	01	—	01000L	062	05000H	051
02	34	K.W Transducer	0	23	—	—	—	—	—
03	35	Flow Transmitter (4-20ma)	0	25	F_21	03300H	063	—	—
04	36	Pressure Transmitter (4-20ma)	0	24	P400	02105H	055	—	—
05	37	Press or Transmitter (4-20ma)	0	24	P401	02405H	055	—	—
06	38	Reference check (10V)	0	02	_P__	10006H	001	09994L	002
07	39	Shift flow total	0	58	006	—	—	—	—
08	40	KW/H (1 hr totals)	1	57	005	—	—	—	—
09	41	Type T thermocouple	0	16	_T1_	00300H	010	—	—
10	42	Type T thermocouple	0	16	_T2_	00055CM	—	—	—
11	43	Type T thermocouple	0	16	_T3_	00100CM	005	—	—
12	44	Type T thermocouple	0	16	_T4_	—	—	—	—
13	45	Type T thermocouple	0	16	_T5_	—	—	—	—
14	46	Type T thermocouple	0	16	_T6_	—	—	—	—
15	47	Type T Reference channel	1	55	_T0_	—	—	—	—
16	48								
17	49								
18	50								
19	51								
20	52								
21	53								
22	54								
23	55								
24	56								
25	57								
26	58								
27	59								
28	60								
29	61								
30	62								
31	63								

PROGRAM PARAMETER FORMATS			MANUAL SECTION
CHANNEL SKIP	X	1 = Skip, 0 = Active	3.2.3.1
FUNCTION NUMBER	XX	0-22 Standard, 23-57 Linear, 58-75 Accumulation	3.2.3.2
CHANNEL ID	AXXX	Choose alpha character from upper lefthand corners of keyboard buttons	3.2.3.3
SOURCE CHANNEL	XXX	Number of channel used as data source for accumulation data	3.2.3.3
LIMIT 1	(-)XXXXX	Numeric value of Limit; HIGH, LOW, CHANGE/MIN, or CHANGE/HOUR	3.2.3.4
LIMIT 2	(-)XXXXX	Numeric value of Limit; HIGH or LOW	3.2.3.6
RELAY 1 & 2	XXX	000-199 Relay Address, even number for even master relay, odd for odd	3.2.3.5

USER DEFINABLE FUNCTION PROGRAM FORM

FUNCTION NUMBER	FUNCTION DESCRIPTION	ZERO OFFSET	SCALE FACTOR	UNITS	FUNCTION NUMBER	FUNCTION DESCRIPTION	TIME INTERVAL	SCALE FACTOR	UNITS
23	Kilowatts	00020	010.00	KW	58	Flow/2 hours	0420	10020	G
24	Pressure (4-20)	0250.0	03020	PSI	59	Kilowatt hours	0060	116.67	KW-H
25	Flow (4-20)	0252.0	10020	GPM	60				
26					61				
27					62				
28					63				
29					64				
30					65				
31					66				
32					67				
33					68				
34					69				
35					70				
36					71				
37					72				
38					73				
39					74				
40					75				
41									
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47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									

USER DEFINABLE FUNCTION FORMATS

LINEAR FUNCTIONS

			Manual Section
ZERO OFFSET	XXXXX	x intercept of output at zero input, position of decimal point sets DVM range	3.2.4.1
SCALE FACTOR	OXXXX	Slope or scaled output at 10000 counts, decimal point position sets display point	3.2.4.2
UNITS	AAA	Letters chosen from upper righthand corners of keyboard buttons	3.2.4.2

ACCUMULATION FUNCTIONS

TIME INTERVAL	XXXX	Minutes of accumulation before total printout and reset	3.2.5.1
SCALE FACTOR	XDDDD	10^{-X} *DDDD; X = 0, 4, DDDD = 4 digit decimal multiplier	3.2.5.2
UNITS	AAA	Letters chosen from upper righthand corners of keyboard buttons	3.2.5.3

Table 3-1 RAMP/Processor Functions

Standard Functions

00	Display Millivolts (Auto ranging)
01	Display 4V Range
02	Display 20V Range
03	Platinum - 100Ω RTD at 1 ma current
04	Platinum - 100Ω RTD in bridge

Thermocouple Functions

05	Type E with External Reference at Ice Point
06	Type J with External Reference at Ice Point
07	Type K with External Reference at Ice Point
08	Type R with External Reference at Ice Point
09	Type S with External Reference at Ice Point
10	Type T with External Reference at Ice Point
11	Type E with Internal Reference
12	Type J with Internal Reference
13	Type K with Internal Reference
14	Type R with Internal Reference
15	Type S with Internal Reference
16	Type T with Internal Reference
17	Type E Reference Channel
18	Type J Reference Channel
19	Type K Reference Channel
20	Type R Reference Channel
21	Type S Reference Channel
22	Type T Reference Channel

User Functions

23-57	Linear Functions
58-75	Accumulation Functions

3.2.3.3 Channel ID

The channel ID is an optional tag which may be appended to a channel in order to facilitate data identification. The channel ID is printed as a letter followed by three digits. The letter may be chosen from the small letters appearing in the upper left-hand corner of each keyboard button. Due to limitations of the front panel seven-segment display, the letters cannot be represented directly. Table 3-2 shows the assignable letters and their corresponding keyboard and display representations. Any digits not entered will be replaced by blanks when the Enter button is pressed. Blanks may be entered in the display by pressing the "." button.

If an accumulation function is assigned to the selected channel the channel ID is used to identify the source channel for the accumulation data. In this case, the display will show only three prompting blanks and a valid three digit channel number must be entered.

TABLE 3-2 Channel ID Letters

Letter	Keyboard	Display
A	0	0
C	1	1
F	2	2
H	3	3
K	4	4
M	5	5
P	6	6
S	7	7
V	8	8
W	9	9
B	HR	H
L	MIN	L
T	-	C
(blank)	.	(blank)

3.2.3.4 Limit 1

Each channel may be assigned two limits, each with an associated relay output. Limit 1 may be any one of the following four types:

1. High (upper bound)
2. Low (lower bound)
3. Change per minute
4. Change per hour

The limit type may be selected by pressing the Limit Type ⟶ button until the desired limit type is illuminated.

The limit value is defined by entering up to five digits from the keyboard. The "-" button may be pressed at any time, defining a negative value for the limit.

There is no decimal point in the limit value. The data on a channel is compared numerically with the limits, regardless of the decimal point location in the data. For this reason, limits should not be assigned to a channel where there is auto ranging data (Function No. 00), since a decimal point shift could cause a false alarm.

The high and low limit types provide thresholds for the channel data; if the data exceeds the threshold for two consecutive samples, the channel goes out of limit. The channel data must go back within the threshold by an extra ten counts before the alarm condition is reset; this feature provides a dead-band, or hysteresis, to prevent erratic tripping of an alarm by slightly fluctuating data.

The change-per-minute and change-per-hour limit types provide checks upon the rate of change of a channel's data. Each sample of the channel data is compared with the baseline value of that channel. If two consecutive samples exceed the specified bound for the rate of change, the channel goes out of limit, and the baseline is updated with the most recent sample. At the end of the minute or hour, the baseline is automatically updated with the most recent sample.

If the Null button is pressed, and then the Enter button, the limit is turned off. This condition is indicated by a limit value being displayed as "_ _ _ _ _". The original limit may be restored by pressing the Limit Type ⟶ button, and then pressing the Enter button.

3.2.3.5 Relay 1

Relay 1 is the number of the optional addressable relay output activated if Limit 1 is tripped. The range of valid relay numbers is 000 to 199.

Each RAMP/Processor is supplied with two relay outputs, specified as the Even and Odd Relay Outputs. Whenever the relay output is activated, the Even Relay output will be activated if the relay number is even. Likewise, the Odd Relay Output will be activated whenever the relay number is odd.

If the Null button is pressed, followed by the Enter button, the relay output is disabled. This condition is indicated by a display of "_ _ _". No contact closures result from a disabled relay.

3.2.3.6 Limit 2

Limit 2 is similar to Limit 1 in function, except that only high or low limit types may be specified.

3.2.3.7 Relay 2

Relay 2 is the number of the relay output activated if Limit 2 is tripped. It is in all respects identical to Relay 1 in function.

3.2.4 Linear Functions

When the Function Parameter ⟶ button is pressed, the secondary display will show the value "_ _". To program a linear function, a function number in the range 23 to 57 must be entered from the keyboard, followed by pressing the Enter button. Once a function number has been selected, pressing the Function Parameter ⟶ button advances the display to the next functional parameter. The current value of each parameter is displayed, along with the function number.

The parameter values for adjacent function numbers may be inspected by pressing the INCR and DECR buttons to increment or decrement the function number selected.

Programming considerations for each functional parameter are described in the following sections. Figure 3-6 may be referred to for clarification.

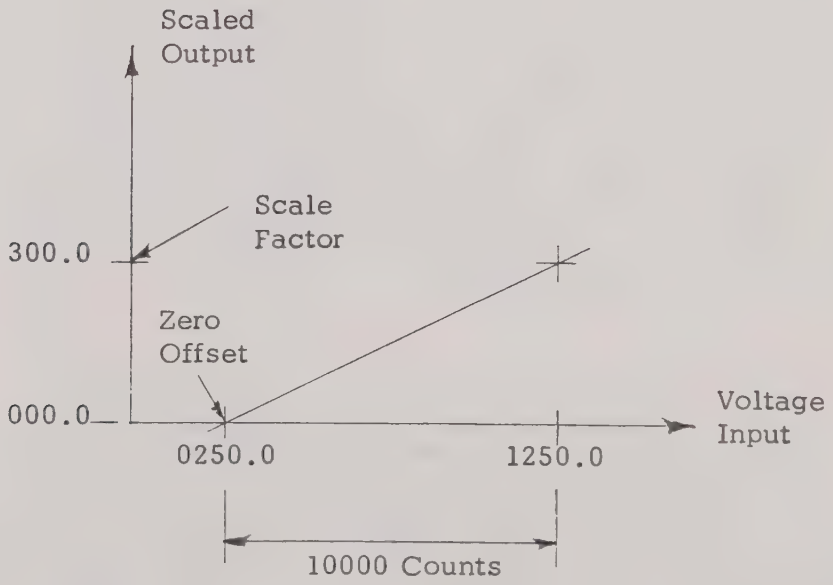


Figure 3-6 Linear Function

3.2.4.1 Zero Offset

The Zero Offset, or x-intercept, is that value of input to the RAMP/Processor for which the displayed value is to be zero.

The location of the decimal point is crucial to the specification of the zero offset. The decimal point specifies the voltage range on which the largest input voltage is to be measured. The allowable decimal point locations are presented in Table 3-3.

If an input exceeds the specified voltage range, an Overload condition exists, shown by the OVERLOAD indicator in the primary display.

TABLE 3-3 Zero Offset Voltage Range

Decimal Point Position	Voltage Range
00.000	40 mv
000.00	400 mv
0000.0	4 V
00000.	20 V

3.2.4.2 Scale Factor

The Scale Factor, or normalized slope, is the value of the displayed output when the input (minus the zero offset) is equal to 10000 counts.

The position of the decimal point determines its position in the printed data. If no decimal point is specified, none will appear in the printout.

Normally, the first digit of the scale factor is zero, which limits the maximum scale factor to 09999. This corresponds to a slope of slightly less than 1. If a slope of precisely 1 is desired, it is necessary to press the Null button and then the Enter button. In this case, the decimal point position will be whatever it was immediately prior to pressing the Null button.

3.2.4.3 Units

The units may be defined by entering up to three letters from those appearing in the upper right-hand corner of the keyboard buttons. Any letters not entered will be replaced by blanks when the Enter button is pressed. Blanks may be entered in the display by pressing the "." button. Table 3-4 presents the assignable letters and their keyboard representations.

Table 3-4 Units Letter Table

Letter	Keyboard	Display
A	0	A
C	1	C
F	2	F
H	3	H
K	4	K
M	5	M
P	6	P
S	7	S
V	8	V
W	9	W
G	HR	G
I	MIN	I
R	-	R
(blank)	.	(blank)

3.2.5 Accumulation Functions

When the Function Parameter ⟶ button is pressed, the secondary display will show the value "_ _". To program an accumulation function, a function number in the range 58 to 75 must be entered in the same manner as that for a linear function.

Programming considerations for each functional parameter are described in the following sections.

3.2.5.1 Time Interval

The time interval for the selected accumulation function is displayed when the Zero Offset indicator is lit. The time interval specifies the number of minutes which must elapse before the accumulated total is printed out and then reset to zero. A value in the range 0 to 9999 must be entered. The minus sign and decimal point are not applicable to the time interval.

3.2.5.2 Scale Factor

The Scale Factor is used to define the selected accumulation function's use as either a totalizing or integrating function. It is also used to scale the accumulated data total to prevent its exceeding the display capacity of 65,535.

Unless otherwise indicated by the decimal multiplier portion of the scale factor, the data input to an accumulation function is assumed to have a time base of one minute. Thus, for a constant input, the accumulated total will be equal to the input after one minute. The input is sampled and added to the accumulated total every 7.5 seconds (eight times per minute).

The scale factor is entered according to the format XDDDD, described below.

X represents a multiplier whose value is equal to 10^{-X}, where X may range from 0 to 4. This provides a power of ten scaling capacity to limit the accumulated total. It may also be used to increase the resolution of the decimal multiplier portion, by replacing leading zeros with an exponential multiplier.

DDDD represents a four digit decimal multiplier. It may be used to average data from a time period. For example, if the output of a pressure transducer calibrated in PSI is to be averaged over a one hour period, the desired factor would be 1/60 = .01667.
In the case where an accumulated total only is desired, set DDDD=0000.

The position of the decimal point determines the decimal point position in the printed data. If no decimal point is entered, none will appear in the printout.
See Section 3.3.5 for specific examples of the selection and application of the scale factor.

3.2.5.3 Units

The units for an accumulation function are selected and entered in exactly the same manner as that for linear function units. See Section 3.2.4.3.

3.2.6 Identifying Data

The identifying data consist of the Run Number, Fixed ID and set clock data. They are entered using the Identifying Data ⟶ button to select each feature.

3.2.6.1 Run Number

The run number is set by entering a three digit number from the keyboard. The run number is incremented for every printout cycle.

3.2.6.2 Fixed ID

Up to eight numbers may be entered to identify specific programs or information sets. The fixed ID remains unchanged during all printout cycles, and may only be altered in the PROGRAM mode. Blanks may be entered in the display be pressing the "." button.

3.2.6.3 Set Clock

Day and time information are entered using the keyboard and Limit Type ⟶ button alternately to set Days, Hours, Minutes and Seconds.

3.2.7 PROGRAM Mode Printouts

The user may obtain listings of the channel parameters, linear functions, and accumulation functions by pressing the Single Log button while in the corresponding mode.

In the case of channel parameters, the First Channel indicator will light. A valid 3-digit channel is then entered from the keyboard, and the Enter button pressed. The Last Channel indicator will light, and another channel number must be entered. When the Enter button is pressed again, the channel parameters for the selected bank of channels will be printed. The format is shown in Figure 3-7.

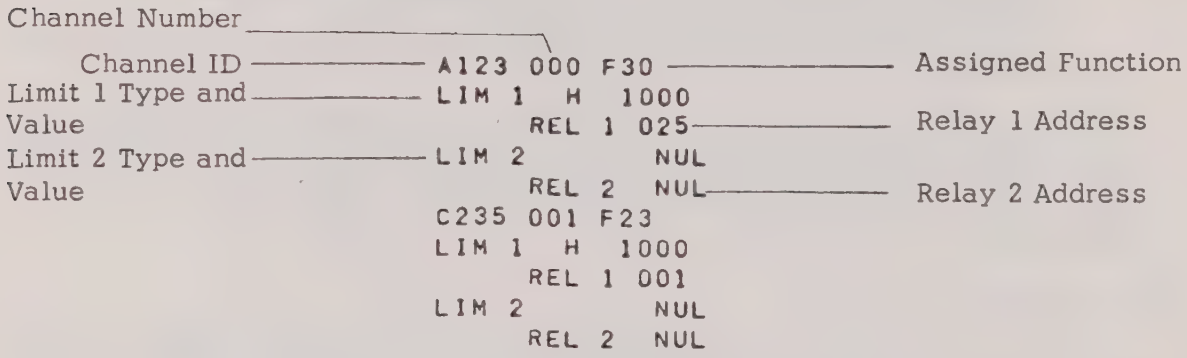


Figure 3-7 Channel Parameter Printout

When the Single Log button is pressed in the linear function or accumulation function modes, the parameters for all such functions are printed. The formats are shown in Figures 3-8 and 3-9.

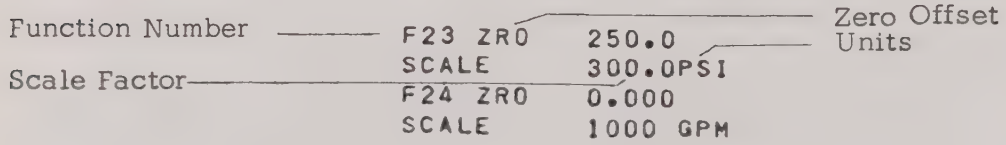


Figure 3-8 Linear Function Printout

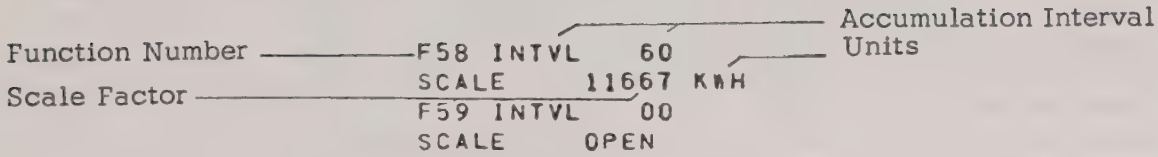


Figure 3-9 Accumulation Function Printout

3.3 Application of RAMP/Processor Features

3.3.1 Introduction - Applications

This section provides detailed descriptions of the operational features of the RAMP/Processor. Examples are provided of how the RAMP system may be used in typical applications.

3.3.2 Thermocouples

The RAMP system is designed to accommodate the most common thermocouple types. The RAMP/Processor has built-in conversion algorithms to handle thermocouple types E, J, K, R, S and T. These are standard functions 05 through 22.

The traditional method for thermocouple measurements is shown in Figure 3-10. The scheme is called "Externally Referenced", since the reference junction is maintained at the ice point by an external temperature reference, such as the Kaye Model K170.

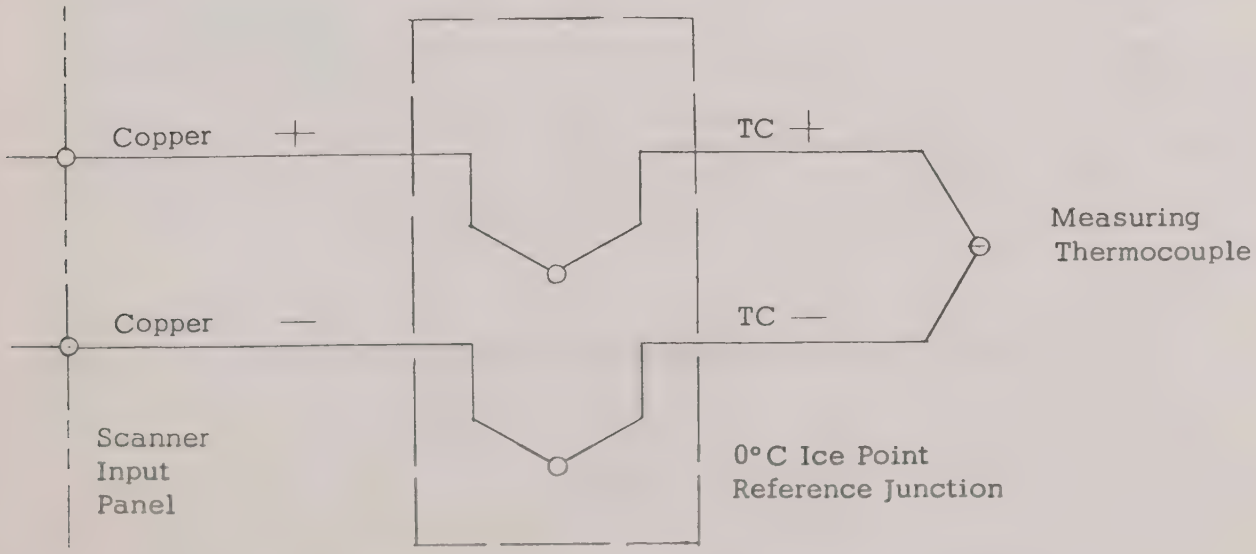


Figure 3-10 Externally Referenced Thermocouple Circuit

The standard technique utilized by the RAMP/System is shown in Figure 3-11. This method is called "Internally Referenced", since the measurement error caused by connecting the thermocouple leads directly to the RAMP/Scanner is cancelled in the RAMP/Processor by the measurement taken on the "Reference Channel". To illustrate, consider a Type T (copper-constantan) thermocouple, with the measurement junction at 100°C and the RAMP/Scanner at 25°C. The thermoelectric voltage for the measurement junction would be 4.277 mv for the externally referenced method. However, in the internally referenced method, the measurement junction will show a voltage of only 3.285 mv. In effect, the connection between the constantan wire of the thermocouple and the RAMP/Scanner terminal forms another thermocouple junction, which causes the error in the measurement. This error is corrected in the RAMP/Processor by taking the measurement from the "Reference Channel" (thermoelectric voltage of Type T at 25°C, or 0.992 mv) and combining it with the measurement junction data, to obtain the equivalent "Externally Referenced" thermoelectric voltage.

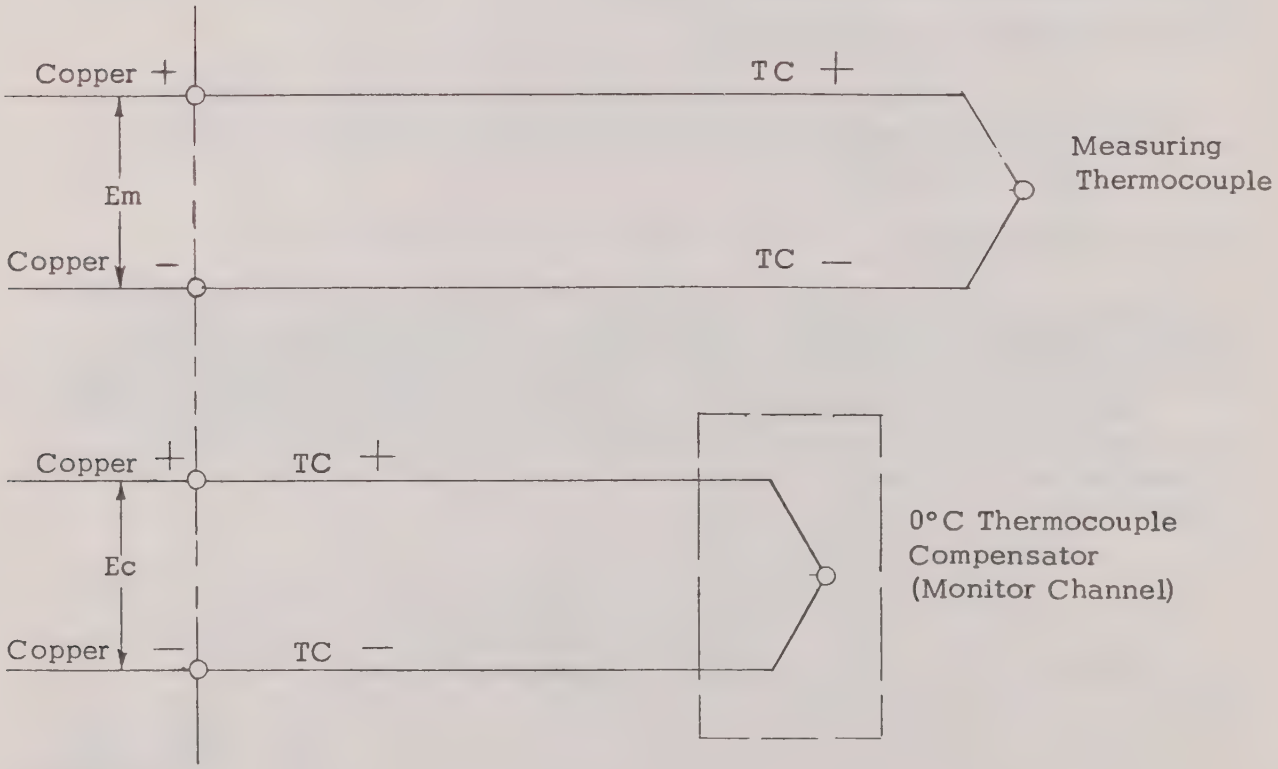


Figure 3-11 Internally Referenced Thermocouple Circuit

The externally referenced scheme offers the best possible accuracy of measurement. The internally referenced scheme has a slight degradation of accuracy, but offers lower cost and easier wiring of thermocouples.

Temperature measurements using thermocouples are based upon NBS Monograph 125, "Thermocouple Reference Tables Based on the IPTS-68". The accuracy of the voltage-to-temperature conversion algorithm is ±0.1°F for the ranges specified in Table 3-5.

3.3.3 Resistance Temperature Detectors

The RAMP/Processor contains two standard functions for 100 ohm platinum resistance temperature detectors (RTD's). Figure 3-12 illustrates an application in which several RTD's are connected in series with a 1 ma constant current source. RTD shunt diodes are available from Kaye Instruments which may be connected across RTD's to preserve circuit continuity in the event of a burn out.

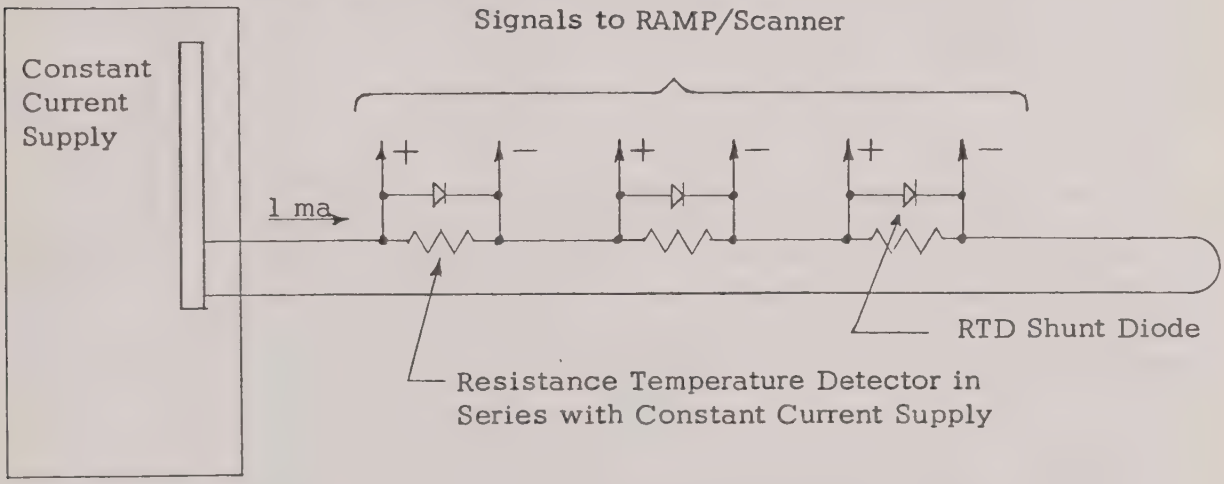


Figure 3-12 RTD's with Constant Current Source

Figure 3-13 shows an alternate method, in which the RTD is part of a bridge circuit; the component values shown are those assumed by the RAMP/Processor. The RAMP/Conditioner may be used for up to 32 bridge circuits. Each circuit contains its own power supply and completion network.

Temperature measurements using 100 ohm platinum RTD's are based upon DIN standard 43760. The accuracy of the voltage-to-temperature conversion algorithm is ±0.1°F, for the range specified in Table 3-5.

Input Type	Range	Conformity to NBS	Accuracy with Solid State Scanner	Accuracy with Reed Relay Scanner
Voltage	40mv, 400mv, 4V, 20V		±(0.02% reading + 2 counts + 13μv)	±(0.01% reading + 2 counts + 4μv)
Thermocouple Type E	-105C to 857C (-158F to 1576F)	0.06C	±(0.02% temperature + 0.5C)	±(0.01% temperature + 0.3C)
Thermocouple Type J	-108C to 1130C (-163F to 2066F)	0.06C	±0.02% temperature + 0.5C)	±(0.01% temperature + 0.3C)
Thermocouple Type K	-105C to 1369C (-157F to 2496F)	0.06C	±(0.02% temperature + 0.6C)	±(0.01% temperature + 0.4C)
Thermocouple Type R	0C to 1777C (32F to 3233F)	0.1C above 260C 20.0C below 260C	±(0.02% temperature + 1.5C)*	±(0.01% temperature + 0.9C)*
Thermocouple Type S	0C to 1765C (32F to 3211F)	0.1C above 260C 19.0C below 260C	±(0.02% temperature + 1.5C)*	±(0.01% temperature + 0.9C)*
Thermocouple Type T	-219C to 402C (-362F to 755F)	0.06C	±(0.02% temperature + 0.6C)	±(0.01% temperature + 0.4C)
Plat, 100Ω RTD, 1 ma	-170C to 855C (-275F to 1570F)	0.06C**	±(0.025% temperature + 0.1C)	±(0.015% temperature + 0.1C)
Plat, 100Ω RTD, bridge	-117C to 849C (-178F to 1560F)	0.06C**	±(0.025% temperature + 0.1C)	±(0.015% temperature + 0.1C)

*Accuracy specification for temperatures above 260C
**Conformity to DIN 43760

System Accuracy includes all instrument errors including conformity to NBS tables, reference junction compensation with worst case thermal scatter of input terminal plane, A/D conversion errors, long term drift, temperature coefficients, and scanner errors. Accuracy statement is based on a 90 day period and an ambient temperature range of 20C to 30C. System Accuracy, 90 days, 20C to 30C ambient.

Table 3-5 Range and Accuracy Specifications; Thermocouples and RTD's

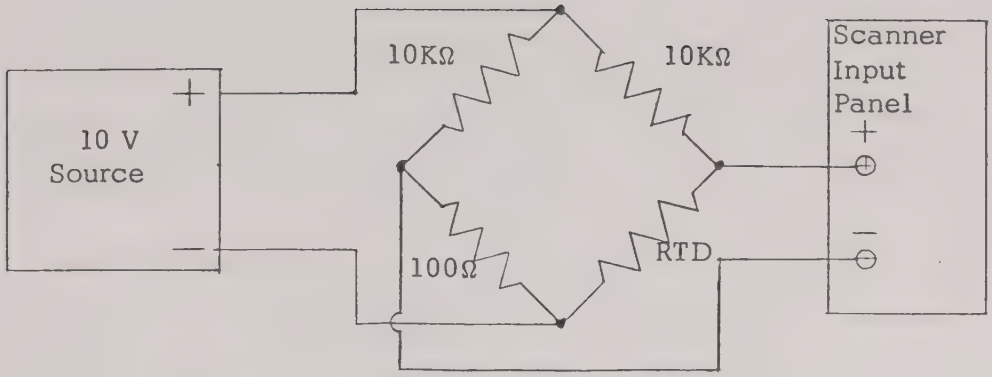


Figure 3-13 RTD in Bridge Configuration

3.3.4 Linear Functions

The linear functions suit a wide variety of transducer inputs, wherever the transducer output has a straight-line correlation with the quantities being measured. For instance, consider the case of a 4-20 ma current transmitter which measures 0-300 PSI. To convert the current to a voltage, a 62.5 ohm precision resistor is installed on the RAMP/Scanner plug-in, thereby providing a 0.25-1.25 V signal for 0-300 PSI (see Figure 3-4). One of the linear functions is programmed, according to the procedures of Section 3.2.4, with a "Zero Offset" of 0250.0, a "Scale Factor" of 0300.0, and "Units" of PSI.

Any channel may have this linear function number assigned to it. When the data from the RAMP/Scanner is received for that channel, the range is compared with that defined by the "Zero Offset". In this case, the data is expected on the 4V range; if the data comes in on the 400 mv or 40 mv range, it is scaled down by a factor of 10 or 100, respectively. The "Zero Offset" is then subtracted from the data, and the data is multiplied by the slope determined by the "Scale Factor". The decimal point is taken from the "Scale Factor", and the data is stored in memory.

3.3.5 Accumulation Functions

Accumulation functions provide the ability to totalize or average data from RAMP/Scanner inputs. When the accumulation function feature is selected during system configuration, up to 64 channel numbers are made available to the RAMP/Processor. The accumulation channels appear in the highest numbered block of channel numbers; this block of channel numbers may also contain "physical" channels as well. Any channel may be specified as a source channel for a named accumulation channel.

Data from the source channel are assumed to have a time base of one minute unless otherwise specified through use of the Scale Factor. If no Scale Factor is assigned, the value of the accumulation channel after one minute will be the average value of the source channel during that minute. The Scale Factor can be used to normalize the data from source channels with time bases other than one minute.

In addition, the Scale Factor provides for power-of-ten scaling of the accumulated total. This is useful since the accumulated total can easily exceed the maximum value which can be printed or displayed (65,535) during long accumulation periods or high rates of accumulation.

The following examples illustrate how this capacity can be used.

Solar energy research utilizes the output of a standard black and white pyranometer to determine incident solar radiation intensity. The output of the pyranometer is to be accumulated over a one hour period, to measure total solar energy. The output of the pyranometer is 10.000 mv for an incident radiation of 267 BTU/Ft^2/Hr. The output of the pyranometer is connected to a RAMP/Scanner channel, which is assigned one of the linear functions. In this case, the Zero Offset would be set at 00.000, specifying the 40 mv range. The Scale Factor would be set at 0267.0, the desired output at the 10000 count input level.

The accumulation function would then be selected and programmed for the accumulation channel. The desired accumulation period of 0060 minutes would be entered in the Time Interval. For a constant input of 10.000 mv, the accumulated total after one hour should be 0267.0 With no Scale Factor set, the total after one hour will be 60 x 00267 = 16020 (disregarding decimal point location). Using the Scale Factor, the accumulated total can be "averaged" to give the true total energy during the one hour time period by setting it to 1166.7. A Scale Factor setting of 1166.7 is equivalent to a multiplier of 0.0166 = 1/60. The decimal point location sets its location in the printout and display.

In the case where data from a channel reporting flow in gallons per minute is to be totalized, the Scale Factor should be set with the power of ten digit followed by zeros. This results in a running total being kept in the accumulation channel.

Negative inputs from the source channel are treated as zero by the accumulation channel. In the first example, this would prevent draining of the total at night.

3.3.6 Alarms

The high and low alarms are self-explanatory and are used for upper and lower bound alarms. In addition, the RAMP/Processor has rate of change alarms, which can be used to advantage in situations similar to that described here.

It is desired to record automatically the temperature history of a batch process reaction that lasts approximately four hours. It is known that the process is characterized at some point by a rapid rate of temperature rise, approximately 15°C/minute for about two minutes and then a gradual return to ambient temperature. The temperature should be known to within 3°C at all times.

The conventional logging approach divides 3°C into the 15°C/minute maximum rate and concludes that five readings are required every minute. For a four hour run approximately 1,200 readings are taken. The number of readings can be minimized by setting the rate-of-change alarm at 3°C per hour. Now any net change in temperature (positive or negative) of 3°C within a one hour interval will force a temperature and time printout and will reset the base temperature. Using the rate-of-change feature only 20 readings are required to characterize this same process, not 1,200.

3.4 RAMP/Display Operation with RAMP/Processor

3.4.1 Introduction - RAMP/Display

The RAMP/Display is a separate accessory which may be used in conjunction with the RAMP/Processor to display the processed data obtained using the RAMP/Processor. It may be used either as a portable set-up and test instrument or as a permanent remote monitor display.

3.4.2 RAMP/Display Interface Connections

The RAMP/Display is connected to the RAMP/Processor by connecting one end of a twisted shielded pair cable to the labeled screw terminals on the rear of the RAMP/Processor. The other end is connected to the labeled connector at the RAMP/Display. The RAMP/Processor transmits a continuous stream of processed data at a fixed 9600 baud rate, from which the RAMP/Display samples data. Only one RAMP/Display may be used with a RAMP/Processor, separated by as much as 5000 feet.

3.4.3 Operation

The RAMP/Display may be used in either of two modes in conjunction with the RAMP/Processor. These modes, NORMAL and INTERRUPT/DISABLE, are described below. See Table 3-6 for a listing of keyboard functions.

Table 3-6 RAMP/Display Keyboard Functions - Processor Section

Normal - Automatically displays all alarm channels
Interrupt Disable - Allows inspection of channel selected from keyboard
Alarm Search - Allows sequential user controlled observation of any alarm channels
Channel Alarm - Indicates channel being displayed is in alarm condition
Sample - Indicates display is being updated
System Alarm - Indicates one or more channels in alarm condition

3.4.3.1 Normal Mode

The Normal Mode is selected by pressing the NORMAL button. This mode is analogous to the Auto Search display mode of the RAMP/Processor, in that any alarm channels will automatically be displayed, along with the channel numbers. In addition, the Channel Alarm and System Alarm indicators will be illuminated.

The Sample indicator flashes to indicate a display update.

3.4.3.2 Interrupt Disable Mode

The Interrupt Disable mode is selected by pressing the INTERRUPT DISABLE button. This mode emulates the Manual Search mode of the RAMP/Processor. Any channel may be selected for display by entering the channel number from the RAMP/Display keyboard. By pressing the Alarm Search button, alarm channels will automatically be selected for display; repeatedly pressing the Alarm Search button will access all alarm channels sequentially. This is a useful feature, since the data transmission rate of 9600 Baud causes the display of multiple alarm channels to cycle too quickly in the Normal mode to be easily read.

The System Alarm indicator will be illuminated any time an active channel is in an alarm condition. The Channel Alarm indicator will light if the displayed channel is in an alarm condition.

3.4.4 Display Indicators

An overrange condition will be indicated by "-----" in the display. An open circuit condition on any addressed channel will cause the left-most digit of the RAMP/Display data field to indicate a small letter "o". The balance of the digits are invalid in this condition.

SECTION 4 - PRINCIPLES OF OPERATION

4.1 Introduction - Operating Principles

The RAMP/Processor utilizes an INTEL 8085 microprocessor chip based Central Processing Unit (CPU) to control all of its data gathering, scaling, alarming and printout activities. The user may specify parameters through the front panel controls in order to tailor the RAMP/Processor's operation to his needs.

The design incorporates a decoupled architecture permitting simultaneous scanning, data processing and data output to various devices. This decoupled architecture permits the RAMP/Processor to transmit data to the devices at rates compatible to them, without affecting the rate at which the CPU receives raw data and operates upon it. Figure 4-1 is a functional block diagram for the RAMP/Processor.

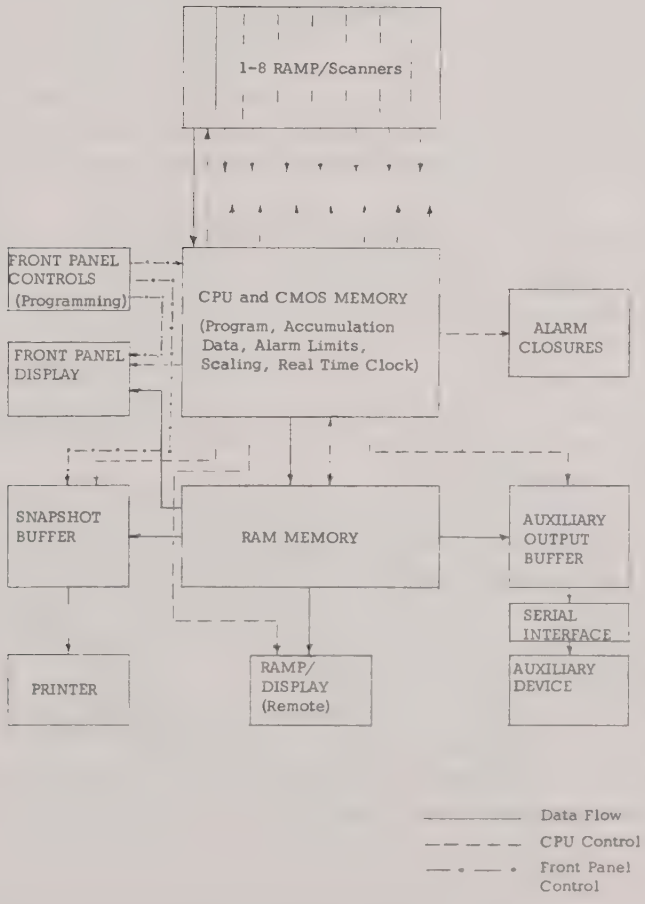


Figure 4-1 RAMP/Processor Functional Block Diagram

4.2 Operational Architecture

The RAMP/Processor receives a continuous stream of information from as many as eight local or remote RAMP/Scanners. The information streams are sent simultaneously by all the RAMP/Scanners and consist of channel number, voltage range, polarity and data for each channel scanned. The information is received by the Scanner I/O card, which presents it to the CPU for processing.

The CPU examines the data for each channel, and by referring to the instructions entered by the user during programming, converts the data into engineering units and stores them in the RAM memory.

The CPU also compares the data for each channel with any limits specified for that channel. If the data exceeds the limit threshold, the CPU will wait for another data set to check against the limit value. If two consecutive samples exceed the threshold the channel is declared by the CPU to be out of limit, at which time it activates various front panel indicators and any specified alarm relay, and may also cause the printer to print an alarm bulletin.

Likewise, the CPU waits until the data are within the threshold value by ten counts before cancelling the alarm indicators and printing an alarm off bulletin. For example, if the high alarm limit is 0500.0, the reset value will be 0499.0. This provides a dead band to eliminate erratic alarm tripping.

Any data specified as a source for an accumulation channel will be first scaled into engineering units by its specified linear function, and then added to the accumulation channel's total, modified by the Scale Factor term for that accumulation channel.

The crystal controlled clock serves as the time base for all of the RAMP/ Processor's activites. Internally, the clock serves to syncronise all of the CPU's functions. The clock is converted into a 24 hour format for time display, and for specifying printout intervals or accumulation periods.

The RAM memory permits the user to request the display of any channel's data without disturbing the data collection activities which operate continuously. In addition, data may be sent to a RAMP/Display without disturbing either the internal activities or front panel display.

When the CPU orders a data printout at a regular time interval, or when a printout request is made from the front panel, the most recent contents of the RAM memory are transferred to a separate "snapshot" buffer memory. The printer uses the contents of this memory for its output. By using a snapshot memory buffer, the data printed out are from a single instant in time, unskewed by the printer's relatively slow printing rate.

When an auxiliary output device such as a magnetic tape, or a computer is connected to the RAMP/Processor, the data are supplied first to an auxiliary output buffer which has a 256 word capacity. Data rates of up to 900 characters per second may be transmitted from this buffer, without interference with other operations.

SECTION 5 - MAINTENANCE

5.1 Introduction - Maintenance

The RAMP/Processor's solid-state design reduces maintenance requirements to a minimum. The only component of the RAMP/Processor requiring routine maintenance is the printer mechanism, which needs periodic cleaning, plus paper and ribbon replenishments.

5.2 Printer Maintenance

5.2.1 Cleaning & Lubrication

The printer should be cleaned with a brush to remove paper dust and chips after using approximately ten packs of paper or after three months of use. Particular attention should be given to the type face of the print drum, which should be completely cleaned with a hard brush to remove all residue and thus restore the initial legibility of the printed characters.

CAUTION: Use only alcohol or benzine to clean the printer surfaces. Thinner, trichlorethylene, ketone, and other solvents will damage the surface finish and the plastic parts used.

Lubrication of the printer mechanism should not be necessary until a minimum of five million lines have been printed. It is recommended that the printer be returned for lubrication and possible overhaul at such time. The printer assembly is removed by lifting it from the printer carrier after removing the four attaching screws and disconnecting the electrical connections.

5.2.2 Paper Replacement

The RAMP/Processor uses 2-1/4" x 5-1/2" fan fold paper in 100 foot packs. To install the paper, pull the printer out to the stop at the end of its slide track. Figure 5-1 shows the printer mechanism extended on its slide.

Lift the paper take-up tray off the paper guide at the printer and the Velcro tab at the rear of the tray and set it aside.

Unwrap and place a new pack of fan fold paper in the supply tray, located under the take-up tray. The free end of the pack may face either direction.

Feed the free end into the slot in the rear of the printer mechanism, as indicated by the arrow.

Press the paper Feed button twice in rapid succession to advance the paper tape through the printer. Push lightly on the paper tape until it engages the drive mechanism of the printer. Repeat if necessary, until the paper end appears above the print drum. Replace the take-up tray on the paper guide and Velcro tab, and slide the printer back into the RAMP/Processor cabinet.

CAUTION: Printing should not be attempted unless paper is in place in the printer mechanism, as wear and damage to the print drum, the hammers, and the inked ribbon will result after a period of operation without paper.

5.2.3 Ribbon Replacement

Figure 5-2 shows the printer ribbon placement. Slide the printer mechanism out of the RAMP/Processor as for paper replacement. Holding the ribbon spools with their drive pins underneath, lower the ribbon between the print wheel and the print hammers.

Thread the ribbon around the ribbon guide rollers at either side of the printer and set the spools on the spool spindles. Be certain the drive pins are engaged. Turn the spool engaged to the the ribbon feeding pawl (the one which ratchets) to ensure that the ribbon is properly seated in the guide rollers.

The black and red inked ribbon should be replaced after six months of use, or whenever the printed characters become difficult to read easily.

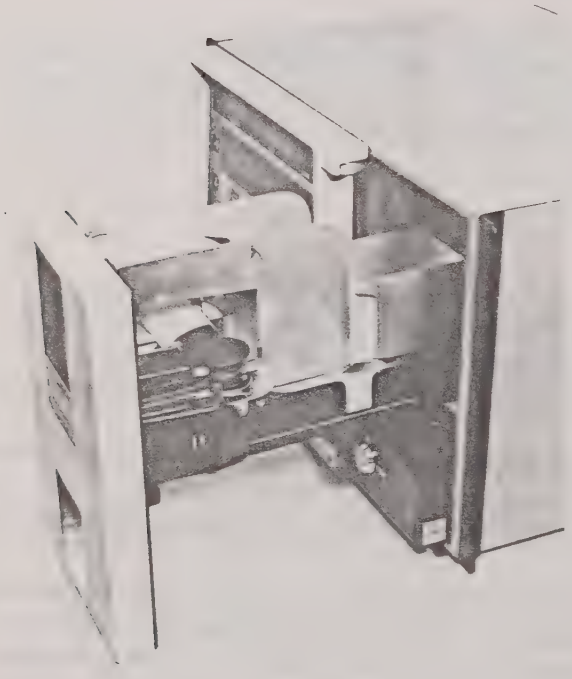


Figure 5-1 Printer Mechanism

Figure 5-2 Ribbon Placement

5.3 Fuse Replacement

The fuse is located at the lower right corner of the RAMP/Processor as shown in Figure 5-1. It is exposed by sliding out the printer. To remove the fuse, press down on the raised lip of the fuse carrier with a coin or fingernail. When the carrier pops out, pull the carrier and fuse from the holder. Replace the fuse in the carrier and return the carrier and fuse to the holder, pushing the carrier in until it latches.

5.4 Printed Circuit Board Insertion and Removal

All printed circuit boards except the display board are housed in guides in the mainframe of the RAMP/Processor cabinet. The display board is mounted on the rear of the front panel with four threaded fasteners and two ribbon cables which connect it to the other circuitry.

To insert a board, align the top and bottom edges of the board in the board guides, first ensuring that the card edge contacts are at the rear of the board, and that the board components are on the side of the board away from the printer. Push the board all the way to the rear of the guides, making certain the card edge contacts are fully seated in the mainframe connector. See Figure 5-3 for printed circuit board locations.

To remove a board, pull on the card ejectors at the front corners of the board to pry the board from its connector. Slide the board out of the guides.

5.5 Tone Volume Control

The volume of the beep tone may be adjusted by means of potentiometer P-1. Potentiometer P-1 is located on the display printed circuit board and is reached by opening the front panel door. Adjustment is made by turning P-1 until the desired volume level is reached.

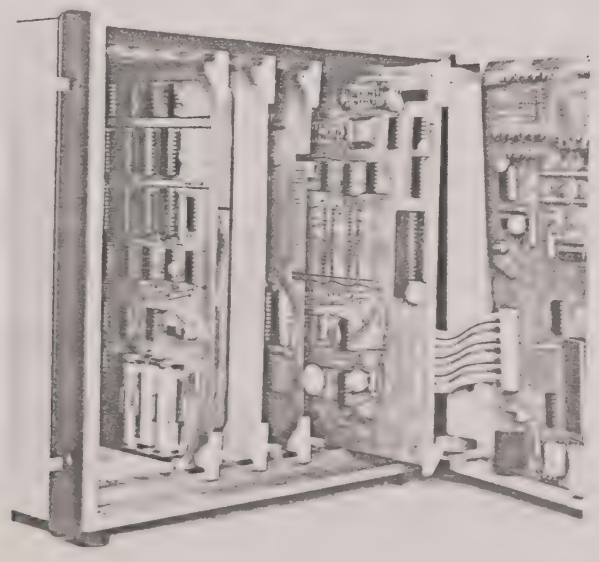


Figure 5-3 Printed Circuit Board Locations

SECTION 6 - TROUBLESHOOTING

6.1 Introduction - Troubleshooting

Troubleshooting for the RAMP/Processor can be divided into two aspects; failure of the RAMP/Processor to turn on, display properly, or print; and self diagnostic error code display. Problems which cannot be identified or resolved using this section should be referred to the Kaye factory service personnel in Bedford, MA.

6.2 Failure of Unit to Turn On, Display or Print

Failure of the RAMP/Processor to turn on when the key switch is turned to RUN can be detected by the absence of a power loss/return printout, blank display, and the absence of noise and air flow associated with the fan. Check first that the power cord is securely plugged in both at the rear panel connection and at the power outlet, and that the outlet is supplying power within the limits described in the specification. Check also that the fuse is not open, and that it is of the proper size and properly installed. If the unit still does not turn on, turn the key switch to OFF, remove the key, and call Kaye Instruments.

If the display is blank or filled with meaningless characters upon power-up, and it will not restore by pressing the Reset button, turn the RAMP/Processor off, wait a few seconds, and try again. Usually this will restore the display. Seemingly meaningless data in the secondary display should be compared with the error messages in Section 6.2 to determine whether they are diagnostic messages. If the display continues to be faulty, check to be sure all the circuit boards are fully engaged in their card edge connectors, and that the display circuit board cable connector is fully seated in its mating half.

Failure of the printer to print is usually a result of its connector having worked free. Check to be certain that the printer connector is fully seated. Loss of red printout is usually caused by the printer ribbon jamming at one end of its travel. To free the ribbon, lift the ribbon spools off the spool spindles and set them on top of the printer body. Notice the pawl and ratchet wheel on each side. Between the ratchet wheels is a hinged bar which stretches across the printer and which controls which of the drive pawls is engaged. To reverse the drive pawls, pull back the left hand ribbon tension arm (facing the RAMP/Processor), and press the end of the cross bar nearest the engaged drive pawl towards the front of the RAMP/Processor. Use the point of a pencil to reach the bar. Replace the ribbon spools on the spool spindles, checking that the ribbon is in the ribbon guides.

6.3 System Self Diagnostics

6.3.1 Introduction - Self Diagnostics

The RAMP/Processor contains a self diagnostic routine as part of its resident software. This routine is designed to detect faulty circuit modules and indicate, by

means of a code displayed in the secondary display. These codes and the suspect modules indicated by them, are listed in the following subsections. Generally speaking, the error codes will be used to isolate faulty operation only to the circuit board level. This permits field board substitution. The faulty board should be returned to Kaye Instruments for repair or replacement.

6.3.2 PROM Failure

The failure of a PROM (Programmable Read Only Memory) on board 2-3815 is indicated by a "1" in the left-most position of the secondary display. The two right-most digits may also display some value; these digits do not matter and may be disregarded. If a PROM has failed, the failure code will be indicated whenever the RAMP/Processor is turned on, or whenever power is returned to it following a power failure.

6.3.3 RAM Failure

Failure of any section of RAM on the CPU PCB No. 2-3815 will be indicated by the appearance of a "2" in the next to left-most position of the secondary display any time the RAMP/Processor is turned on. The two digits appearing at the right-most end of the display may be used in conjunction with Table 6-1 to isolate suspect modules.

6.3.4 CMOS RAM Failure

Failure of any section of CMOS RAM on either the CMOS PCB No. 2-3818 or 6K CMOS RAM PCB No. 2-3820, will be indicated by the display of a "3" in the second to left-most position of the secondary display. This digit, and the two in the two right-most positions, will be displayed in the PROGRAM mode when a failure is present. The two right hand digits may be used in conjunction with Table 6-1 to identify suspect modules.

Table 6-1 Diagnostic Failure Codes

Failure Type	Circuit Board	Displayed Code	Suspect Modules
PROM	2-3815	1, XX	--
RAM	2-3815	80, 81, 82, 83	MG2, MH2
		84, 85, 86, 87	MG3, MH3
		88, 89, 8H, 8L	MG4, MH4
		8C, 8_, 8-, 8ø	MG5, MH5
		90, 91, 92, 93	MG6, MH6
		94, 95, 96, 97	MG7, MH7
		98, 99, 9H, 9L	MG8, MH8
		9C, 9_, 9-, 9ø	MG9, MH9
CMOS RAM	2-3818	C0	M21, M31
		C1	M22, M32
		C2	M23, M33
		C3	M24, M34
		C4	M25, M35
		C5	M26, M36
		C6	M27, M37
		C7	M28, M38
CMOS RAM (6K)	2-3820	C8	MA1, MB1
		C9	MC1, MD1
		CH	MA2, MB2
		CL	MC2, MD2
		CC	MA3, MB3
		C_	MC3, MD3
		C-	MA4, MB4
		Cø	MC4, MD4
		_0	MA5, MB5
		_1	MC5, MD5
		_2	MA6, MB6
		_3	MC6, MD6
		_4	MA7, MB7
		_5	MC7, MD7
		_6	MA8, MB8
		_7	MC8, MD8
		_8	MA9, MB9
		_9	MC9, MD9
		_H	MA10, MB10
		_L	MC10, MD10
		_C	MA11, MB11
		__	MC11, MD11
		_-	MA12, MB12
		_ø	MC12, MD12

SECTION 7 - REPLACEABLE PARTS

7.1 RAMP/Processor

Reference Designation	Description	Part Number	Recommended Spare Quantity
2-3815	CPU PCB Level I	U0710A	1
2-3815	CPU PCB Level II (Optional)	U0710B	(1)
2-3816	Interface PCB	U0715	1
2-3817	Display PCB	U0720	1
2-3818	CMOS PCB	U0725	1
2-3819	Scanner I/O PCB Level I	U0730A	1
2-3819	Scanner I/O PCB Level II (Optional)	U0730B	(1)
2-3820	6K CMOS RAM PCB (Optional)	U0735	(1)
2-3821	Alarm Relay PCB (Optional)	U0740	0
2-3822	Auxiliary I/O PCB (Optional)	--	0
	Power Supply	M0962	0
	Printer	M1085	0
	Printer Take-up Tray	J4700	0
	Muffin Fan	M0940	0
	Muffin Fan (for 220/250 VAC, 50 Hz only)	M0941	(0)
	Rack Mounting Angle (Set of 2)	J4610	0
	Fuse 1A 3AG Slo Blo (115 VAC only)	M0060	5
	Fuse .5A 3AG Slo Blo (220/250 VAC only)	M0040	(5)

7.2 Accessories

Reference Designation	Description	Part Number	Recommended Spare Quantity
	Fanfold Paper 2-1/4" x 5-1/2" (24 in a box)	M0735	1
	Printer Ribbon (12 in a box)	M0751	1
	RS232C Cable Male Connector (Optional)	--	(0)
	RS232C Cable Female Connector (Optional)	--	(0)
	20 ma TTY Cable (10 ft.) (Optional)	--	(0)
	Alarm Relay Circuit Board Connector (Optional)	E0240	(0)

7.3 Ordering Notes

The recommended spares indicated are those parts whose failure would disable the RAMP/Processor, preventing it from performing its duties. Kaye Instruments does not suggest that these components are in any way more prone to failure than any others. In applications where the loss of data or delay would be costly, having spare parts available is a prudent policy.

When requesting spare or replacement parts, it is important to indicate the model and serial number of the instrument for which the parts are intended.

APPENDIX A

RAMP/Data Logger Check List

This check list is intended to serve as a convenient guide for the assembly and operation of a RAMP/Data Logger consisting of a RAMP/Processor, one to eight RAMP/Scanners and optional serial data interface and alarm relay boards. Detailed information for each item on the check list may be found by referencing the Installation, Operation and Maintenance Manual section listed. Listings will be in the form: (Processor, Sec. 2.1) or (Scanner, Sec. 2.4).

1. ( ) Unpack each item, carefully inspecting it for shipping damage, and checking each item against its packing slip. In case of damage refer to Processor Sec. 2.1.

2. ( ) Carefully review the contents of both manuals before proceeding any further.

3. ( ) Install a Reference Voltage and Thermocouple Compensator Supply and up to four thermocouple Compensator Modules in each RAMP/Scanner, if necessary. If these were ordered with a RAMP/Scanner, they should already be installed (Scanner Sec. 3 .11, 3.12).

4. ( ) Perform the Performance Test outlined in Scanner Sec. 4, and if results are satisfactory, install the RAMP/Scanner and RAMP/Processor in any racks or panels, and connect AC power to them (Processor, Sec. 2.3, Scanner Sec. 3.2, 3.3).

5. ( ) Connect each RAMP/Scanner to the RAMP/Processor using four-conductor twisted pair shielded cable (Part No. SPC-(*)). Follow the procedure outlined in Processor Sec. 2.4.1, Scanner Sec. 3 .4.1.1.

6. ( ) Set the DIP switch on each RAMP/Scanner plug-in card in accordance with Scanner Sec. 3.6.

7. ( ) Connect the input wiring for each RAMP/Scanner to the plug-in board screw terminals (Scanner Sec. 3.8).

8. ( ) Set the DIP switch on each RAMP/Scanner Inguard Logic board in accordance with Scanner Sec. 3 .7.

9. ( ) Set the baud rate selection jumper, located on the Inguard Logic Board for each RAMP/Scanner, to 2400 (Scanner Sec. 3.7.2).

10. ( ) Connect any alarm devices to the standard alarm relay terminals on the rear of the RAMP/Processor (Processor Fig. 2-5). Plug-in optional alarm relay board connectors wired for optional addressable alarm devices (Processor Sec. 2.4.2.2, Fig. 2-5, Fig. 2-7).

11. ( ) If an optional auxiliary I/O interface board is installed in the RAMP/Processor, set the interface parameters via the board DIP switch(es) (Processor Sec. 2.4.3, Table 2-3 or 2-4).

12. ( ) Plug in the auxiliary I/O interface connector if an optional interface board is installed.

13. ( ) Initialize the RAMP/Processor (Processor, Sec. 2.5).

14. ( ) List the RAMP/Processor programming parameters on the RAMP/Processor Program Form. Use the reverse side of the form for linear and accumulation functions.

15. ( ) Program the RAMP/Processor (Processor Sec. 3.2, 3.3).

16. ( ) Set the RAMP/Processor real-time clock, if necessary (Processor Sec. 3.2.6.3).

17. ( ) Set the RAMP/Processor Run Number and Fixed ID if desired (Processor Sec. 3.2.6.1, 3.2.6.2).

18. ( ) Check each RAMP/Scanner to be certain its key switch is in the ON LINE position.

19. ( ) Check the RAMP/Processor paper and inked ribbon supply (Processor Sec. 5.

20. ( ) Set the First and Last channels, and the Log Interval (Processor Sec. 3.1).

The entire check list needs to be followed only during the initial system set-up and operation. At other times parts of the check list should be referenced as outlined below.

Steps 17-20 should be checked each time the RAMP/Data Logger is operated.

If input types are changed at the RAMP/Scanners, steps 5,7,10,13 (if a °F/°C change is required), and 14-20 need to be checked.

If the number of RAMP/Scanners used in the RAMP system is changed, steps 7,8,9 and 13-20 should be checked.

RAMP/PROCESSOR PROGRAM FORM

BLOCK NUMBER _____ DATE _____
FIRST CHANNEL _____ LAST CHANNEL _____ LOG INTERVAL _____ ___HR ___MIN FIXED ID _____

CHANNEL		INPUT DESCRIPTION	SKIP	FUNCTION	CHANNEL ID SOURCE CHANNEL	LIMIT 1	RELAY 1	LIMIT 2	RELAY 2
00	32								
01	33								
02	34								
03	35								
04	36								
05	37								
06	38								
07	39								
08	40								
09	41								
10	42								
11	43								
12	44								
13	45								
14	46								
15	47								
16	48								
17	49								
18	50								
19	51								
20	52								
21	53								
22	54								
23	55								
24	56								
25	57								
26	58								
27	59								
28	60								
29	61								
30	62								
31	63								

PROGRAM PARAMETER FORMATS			MANUAL SECTION
CHANNEL SKIP	X	1 = Skip, 0 = Active	3.2.3.1
FUNCTION NUMBER	XX	0-22 Standard, 23-57 Linear, 58-75 Accumulation	3.2.3.2
CHANNEL ID	AXXX	Choose alpha character from upper lefthand corners of keyboard buttons	3.2.3.3
SOURCE CHANNEL	XXX	Number of channel used as data source for accumulation data	3.2.3.3
LIMIT 1	(-)XXXXX	Numeric value of Limit; HIGH, LOW, CHANGE/MIN, or CHANGE/HOUR	3.2.3.4
LIMIT 2	(-)XXXXX	Numeric value of Limit; HIGH or LOW	3.2.3.6
RELAY 1 & 2	XXX	000-199 Relay Address, even number for even master relay, odd for odd	3.2.3.5

USER DEFINABLE FUNCTION PROGRAM FORM

FUNCTION NUMBER	FUNCTION DESCRIPTION	ZERO OFFSET	SCALE FACTOR	UNITS
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				

FUNCTION NUMBER	FUNCTION DESCRIPTION	TIME INTERVAL	SCALE FACTOR	UNITS
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

USER DEFINABLE FUNCTION FORMATS

			Manual Section
LINEAR FUNCTIONS			
ZERO OFFSET	XXXXX	x intercept of output at zero input, position of decimal point sets DVM range	3.2.4.1
SCALE FACTOR	OXXXX	Slope or scaled output at 10000 counts, decimal point position sets display point	3.2.4.2
UNITS	AAA	Letters chosen from upper righthand corners of keyboard buttons	3.2.4.2
ACCUMULATION FUNCTIONS			
TIME INTERVAL	XXXX	Minutes of accumulation before total printout and reset	3.2.5.1
SCALE FACTOR	XDDDD	10^{-X} *DDDD; X = 0, 4, DDDD = 4 digit decimal multiplier	3.2.5.2
UNITS	AAA	Letters chosen from upper righthand corners of keyboard buttons	3.2.5.3

APPENDIX B

8-Bit ASCII Code Used by RAMP/Processor

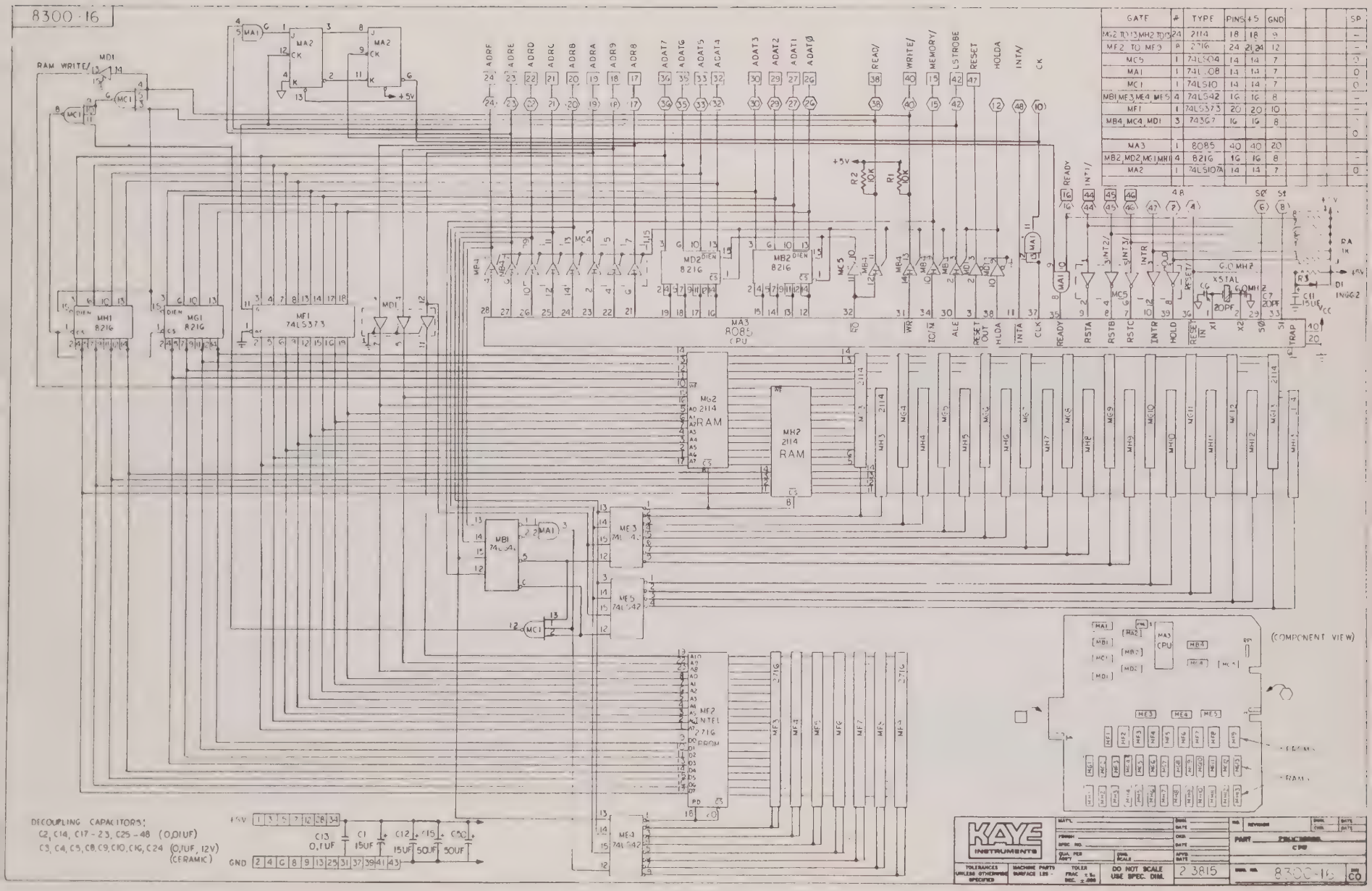
Character	Bit 1	Bit 2	Bit 4	Bit 8	Bit A	Bit B	Bit C	Parity
0					X	X		
1	X				X	X		X
2		X			X	X		X
3	X	X			X	X		
4			X		X	X		X
5	X		X		X	X		
6		X	X		X	X		
7	X	X	X		X	X		X
8				X	X	X		X
9	X			X	X	X		X
-	X		X	X		X		
.		X	X	X		X		
>		X	X	X	X	X		X
<			X	X	X	X		
A	X						X	
B		X					X	
C	X	X					X	X
F		X	X				X	X
G	X	X	X				X	
H				X			X	
I	X			X			X	X
K		X		X			X	X
L			X	X			X	X
M	X		X	X			X	
P					X		X	
R		X			X		X	X
S	X	X			X		X	
T			X		X		X	X
V		X	X		X		X	
W	X	X	X		X		X	X
LF		X		X				
CR	X		X	X				
DEL, ■	X	X	X	X	X	X	X	X
ø						X		X
:		X		X	X	X		

APPENDIX C

Schematics

Drawing Number	Description
8300-16	CPU PCB
8300-17	Interface PCB
8300-18	Display PCB
8300-19	CMOS PCB
8300-20	Scanner I/O PCB
8300-21	6K CMOS RAM PCB
8300-22	Alarm Relay PCB
8300-23	Auxliary I/O PCB
C9200-33	RAMP/Processor Control Circuit Diagram

8300-16



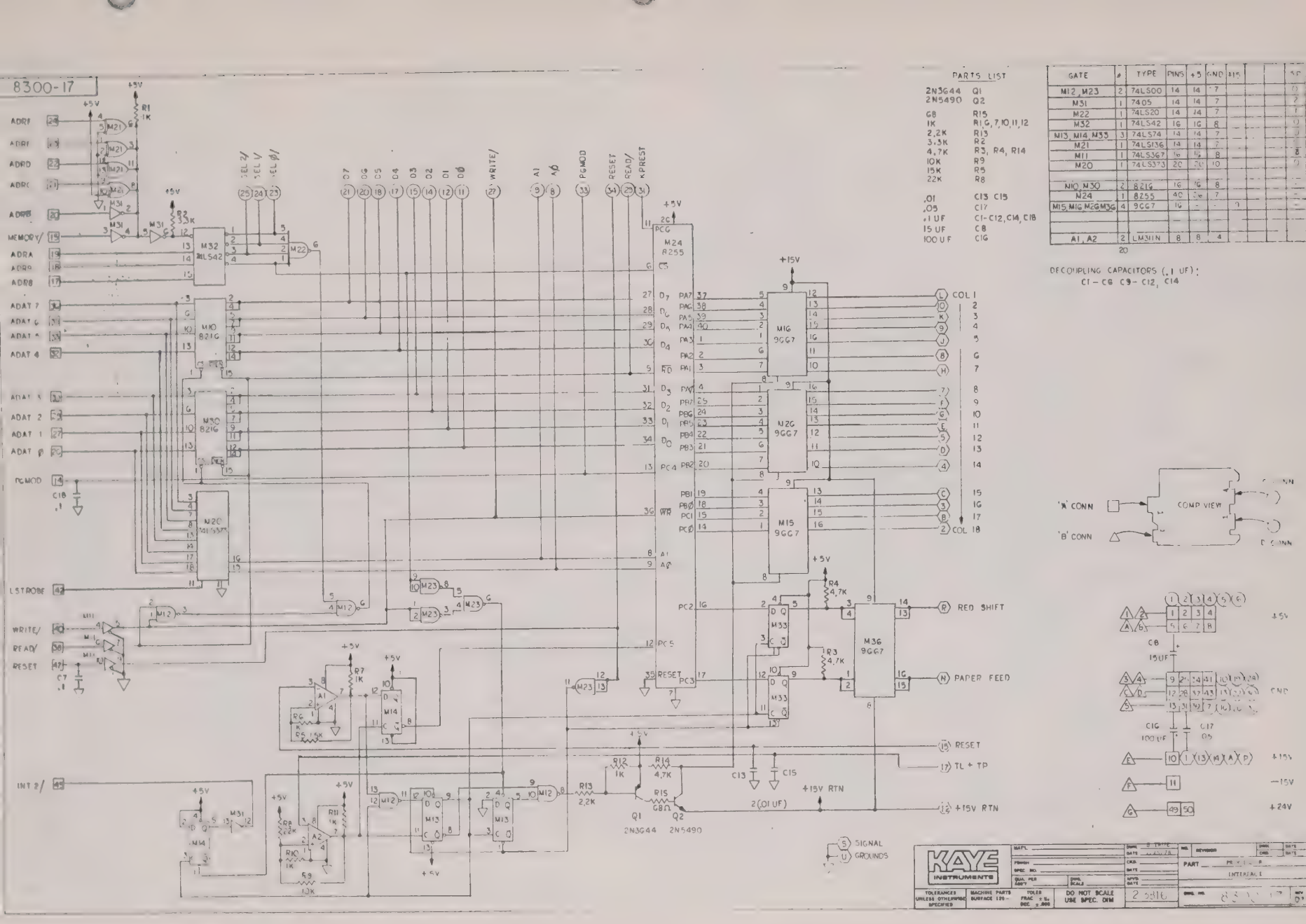
GATE	#	TYPE	PINS	+5	GND			SP.
MG2 TO 13, MH2 TO 3	24	2114	18	18	9			1
MF2 TO MF3	8	2716	24	21,24	12			1
MC5	1	74LS04	14	14	7			0
MA1	1	74L.08	14	14	7			0
MC1	1	74LS10	14	14	7			0
MB1, ME3, ME4, ME5	4	74LS42	16	16	8			1
MF1	1	74LS373	20	20	10			1
MB4, MC4, MD1	3	7437	16	16	8			1
								0
MA3	1	8085	40	40	20			1
MB2, MD2, MG1, MH1	4	8216	16	16	8			1
MA2	1	74LS107A	14	14	7			0

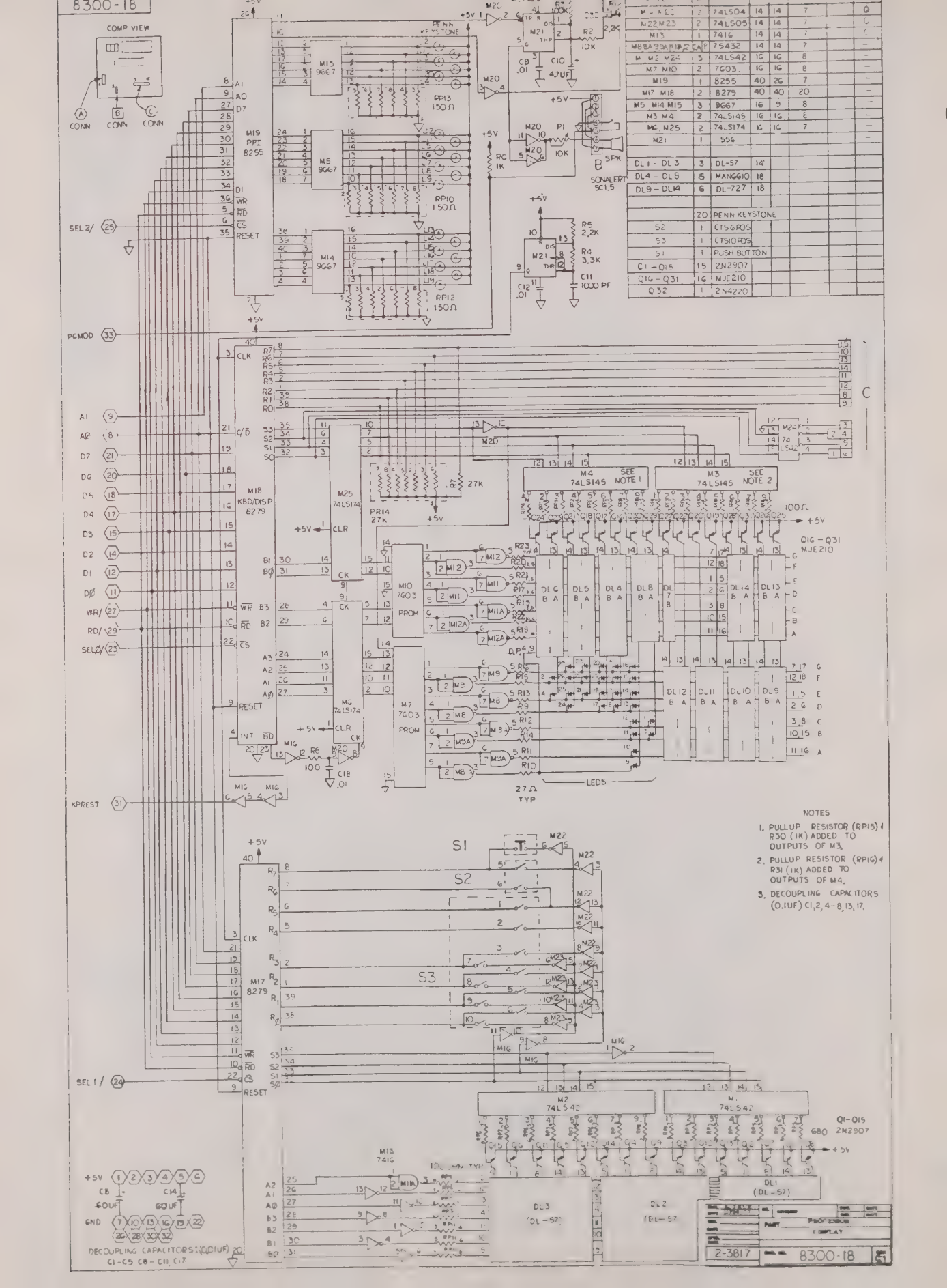
KAYE INSTRUMENTS

MATL			NO.	REVISION
FINISH			DRWN DATE	
SPEC NO.			CHKD DATE	
QUAL. PER ASSY		DRWN SCALE	APVD DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED	MACHINE PARTS SURFACE 125 -	TOLER FRAC ± DEC. ± .005	DO NOT SCALE USE SPEC. DIM.	23815

PART: CPU

DRWG. NO. 8300-16 REV. CO

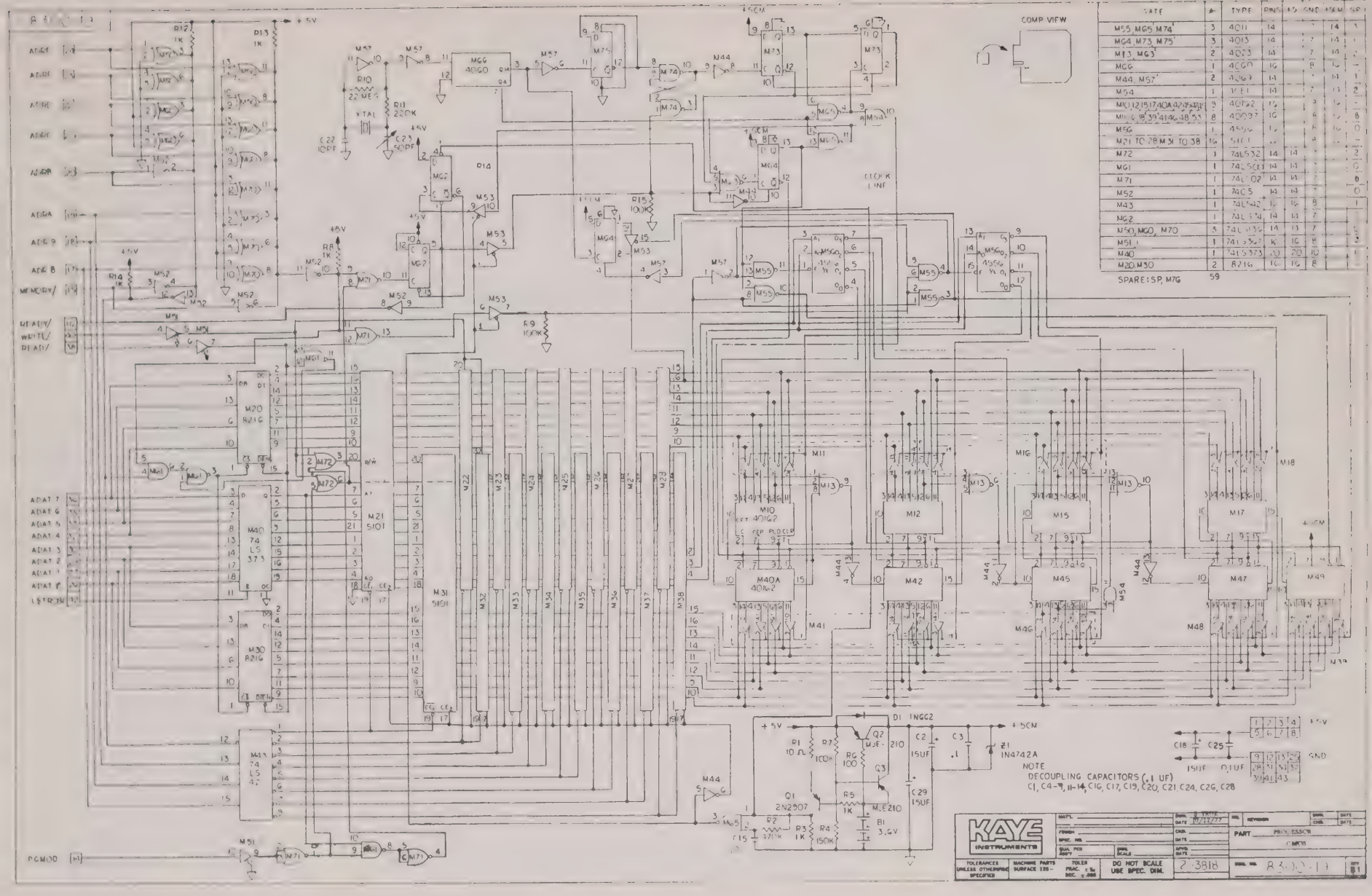

8300-17
PARTS LIST
2N3644 Q1
2N5490 Q2
G8 R15
1K R1,6,7,10,11,12
2.2K R13
3.3K R2
4.7K R3, R4, R14
10K R9
15K R5
22K R8
.01 C13 C15
.05 C17
.1 UF C1-C12, C14, C18
15 UF C8
100 UF C16
GATE # TYPE PINS +5 GND ±15
M12, M23 2 74LS00 14 14 7
M31 1 7405 14 14 7
M22 1 74LS20 14 14 7
M32 1 74LS42 16 16 8
M13, M14, M33 3 74LS74 14 14 7
M21 1 74LS136 14 14 7
M11 1 74LS367 16 16 8
M20 1 74LS373 20 20 10
M10, M30 2 8216 16 16 8
M24 1 8255 40 5e 7
M15, M16, M26, M36 4 9GG7 16
A1, A2 2 LM311N 8 8 4
20
DECOUPLING CAPACITORS (.1 UF):
C1 - C6 C9 - C12, C14
ADR7
ADR6
ADR5
ADR4
ADR3
MEMORY/
ADRA
ADR9
ADR8
ADAT 7
ADAT 6
ADAT 5
ADAT 4
ADAT 3
ADAT 2
ADAT 1
ADAT 0
PGMOD
LSTROBE
WRITE/
READ/
RESET
INT 2/
SEL 2/
SEL 1
SEL 0/
D7 D6 D5 D4 D3 D2 D1 D0
WRITE/
A1 A0
PGMOD
RESET
READ/
KPREST
M24 8255
M10 8216
M30 8216
M20 74LS373
M32 74LS42
M16 9GG7
M26 9GG7
M15 9GG7
M36 9GG7
M33
M14
M13
M12
M23
M22
M31
M21
M11
COL 1
COL 18
RED SHIFT
PAPER FEED
RESET
TL + TP
+15V RTN
2N3644 2N5490
SIGNAL GROUNDS
'A' CONN
'B' CONN
COMP VIEW
+5V
GND
+15V
-15V
+24V
KAYE INSTRUMENTS
DO NOT SCALE USE SPEC. DIM

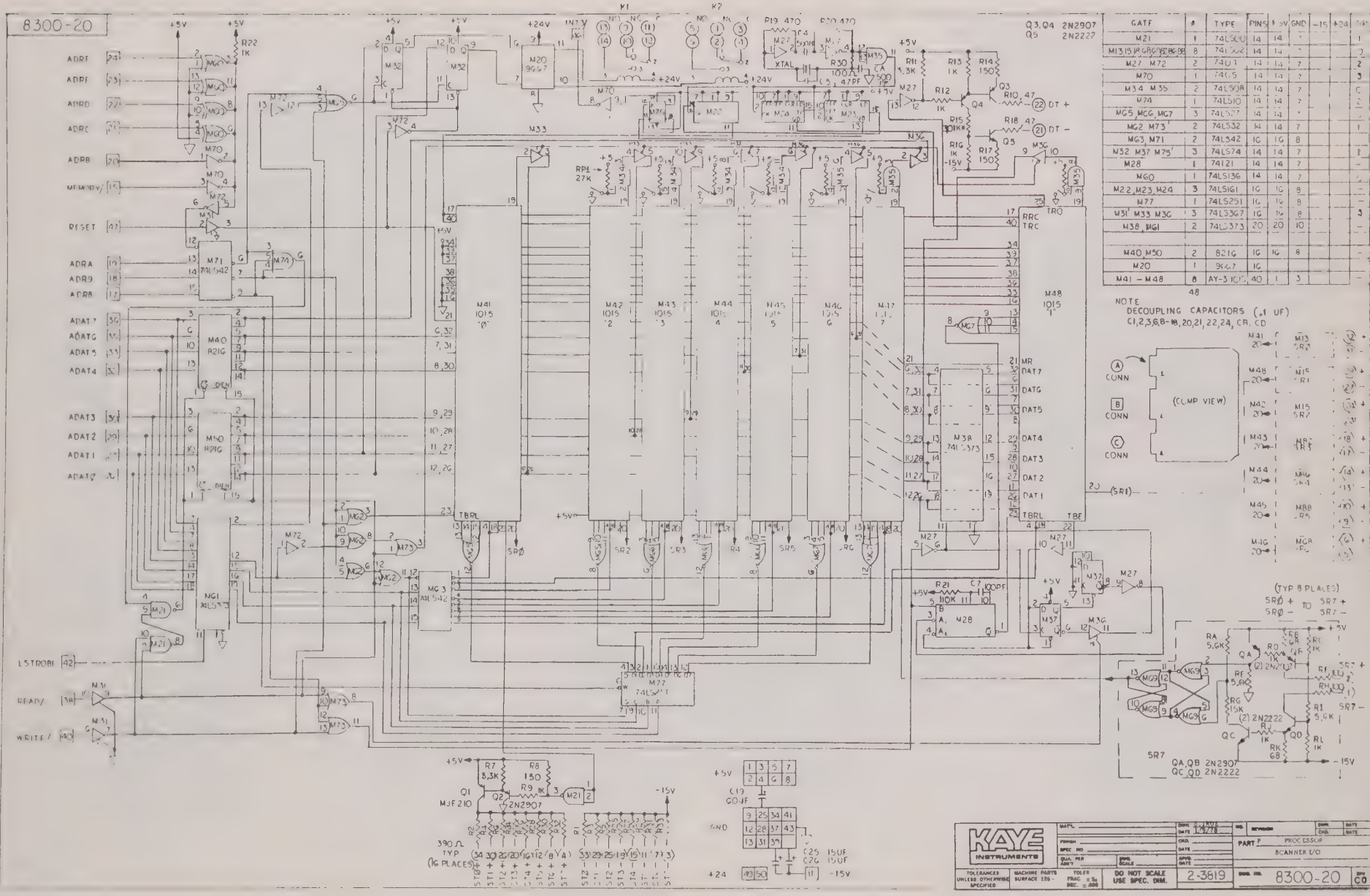


M6 M12	2	74LS04	14	14	7	0
M22 M23	2	74LS05	14	14	7	C
M13	1	7416	14	14	7	C
M8 M9 M11 M12	4	75432	14	14	7	–
M1 M2 M24	3	74LS42	16	16	8	–
M7 M10	2	7603	16	16	8	–
M19	1	8255	40	26	7	–
M17 M18	2	8279	40	40	20	–
M5 M14 M15	3	9667	16	9	8	–
M3 M4	2	74LS145	16	16	8	–
M6 M25	2	74LS174	16	16	7	–
M21	1	556				–
DL1 - DL3	3	DL-57	14			
DL4 - DL8	5	MAN6610	18			
DL9 - DL14	6	DL-727	18			
	20	PENN KEYSTONE				
S2	1	CTS6POS				
S3	1	CTS10POS				
S1	1	PUSH BUTTON				
C1 - C15	15	2N2907				
Q16 - Q31	16	MJE210				
Q32	1	2N4220				

NOTES

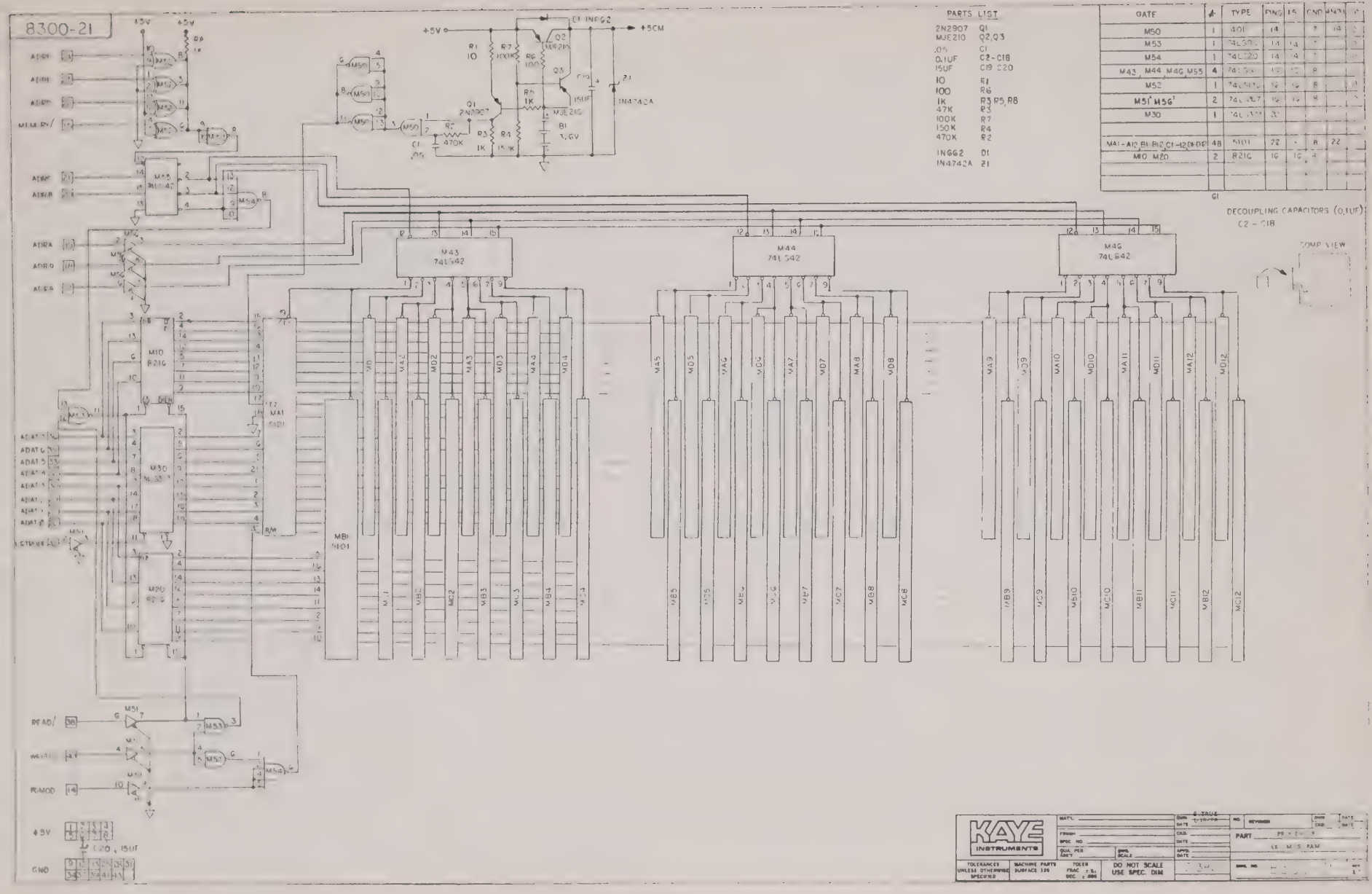
1. PULLUP RESISTOR (RP15) & R30 (1K) ADDED TO OUTPUTS OF M3.
2. PULLUP RESISTOR (RP16) & R31 (1K) ADDED TO OUTPUTS OF M4.
3. DECOUPLING CAPACITORS (0.1UF) C1,2,4-8,13,17.


COMP VIEW
SPARE: SP, M76
NOTE
DECOUPLING CAPACITORS (.1 UF)
C1, C4-9, 11-14, C16, C17, C19, C20, C21 C24, C26, C28
KAYE INSTRUMENTS
PART PROM ESSCM
CMOS

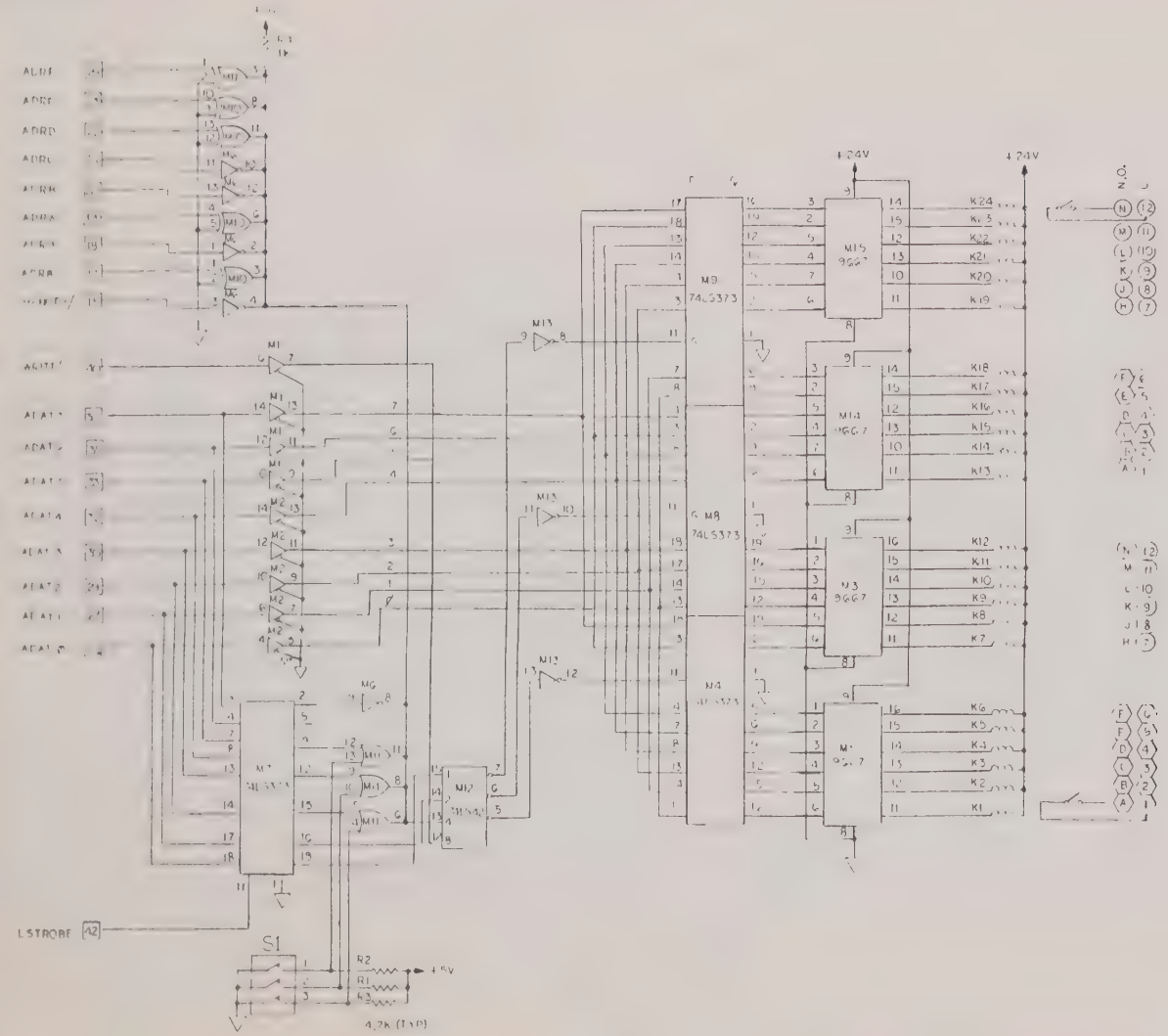


GATE	#	TYPE	PINS	+5V	GND	-15	+24	
M21	1	74LS00	14	14	-			1
M13 15 16 GB GC BB BC BB	8	74LS02	14	14	-			
M27 M72	2	7403	14	14	7			2
M70	1	7404	14	14	7			3
M34 M35	2	74LS08	14	14	7			
M74	1	74LS10	14	14	7			
MG5 MG6 MG7	3	74LS27	14	14	7			
MG2 M73	2	74LS32	14	14	7			1
MG3 M71	2	74LS42	16	16	8			
N32 M37 M75	3	74LS74	14	14	7			1
M28	1	74121	14	14	7			
MG0	1	74LS136	14	14	7			
M22 M23 M24	3	74LS161	16	16	8			
M77	1	74LS251	16	16	8			
M31 M33 M36	3	74LS367	16	16	8			3
M38 MG1	2	74LS373	20	20	10			
M40 M50	2	821G	16	16	8			
M20	1	9667	16					
M41 - M48	8	AY-3 1015	40	1	3			

48


8300-21
PARTS LIST
2N2907 Q1
MJE210 Q2,Q3
.05 C1
0.1UF C2-C18
15UF C19 C20
10 R1
100 R6
1K R3,R5,R8
47K R3
100K R7
150K R4
470K R2
IN6G2 D1
IN4742A Z1
GATE
M50
M53
M54
M43, M44 M46 M55
M52
M51 M56
M30
M1-A12 B1 B12 C1-12 D1 D12
M10 M20
DECOUPLING CAPACITORS (0.1UF)
C2 - C18
COMP VIEW
M43 74LS42
M44 74LS42
M46 74LS42
M10 8216
M20 8216
M30
M1 5101
MB1 5101
+5V
+5CM
IN6G2
IN4742A
1.6V
470K
1K
15K
M.1
M.2
M.3
M.4
MB1
MC1
MC2
MC3
MC4
MC5
MC6
MC7
MC8
MC9
MC10
MC11
MC12
READ/
WRITE/
RMOD
C20, 15UF
KAYE INSTRUMENTS
DO NOT SCALE
USE SPEC. DIM

F300-22



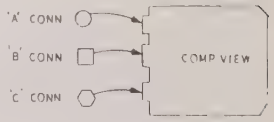
PARTS LIST

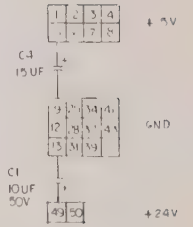
1K	R4
4.7K	R1-R3
.01UF	C9,C10
0.1UF	C2,3,5-8
10UF	C1
15UF	C4

GATE	#	TYPE	PINS	+5	GND
M13	1	7404	14	14	7
M7	1	7430	14	14	7
M12	1	7421	14	14	7
M10, M11	2	7421	14	14	7
M1, M6	2	7430	14	14	7
M4, M7, M8, M9	4	7430	14	14	7
M3, M5, M14, M15	4	7427	14	14	7

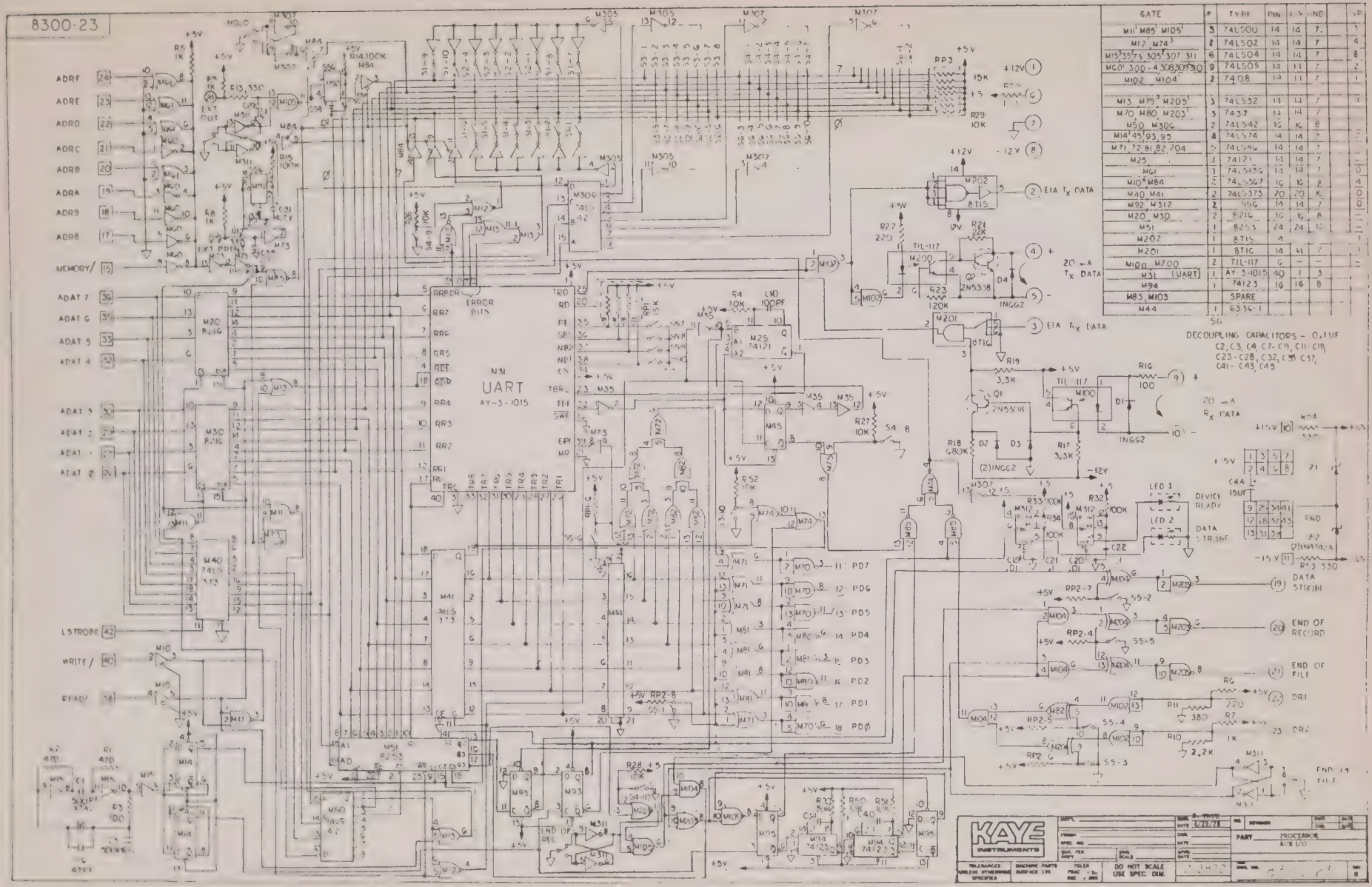
15

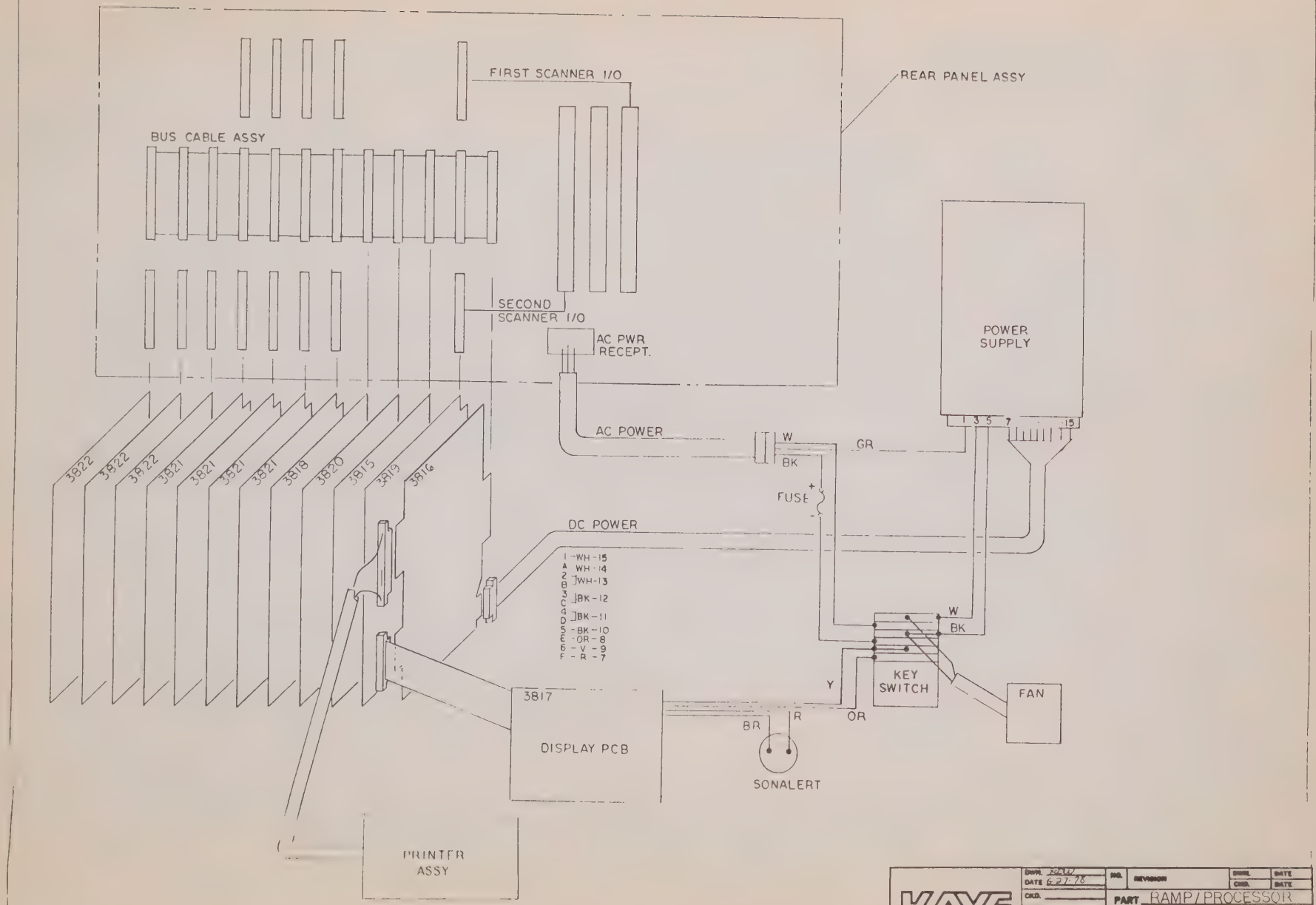
DECOUPLING CAPACITORS
(0.1UF)
(.01UF)





KAYE INSTRUMENTS	MATL	DWN. DATE 5/27/78	NO.	REVISION	DWN. CHD. DA
	FINISH	CHD. DATE			
	SPEC. NO.	APVD. DATE	PART	PROCESSOR ALARM RELAY	
	QUA. PER ASS'Y	DWG. SCALE			
TOLERANCES UNLESS OTHERWISE SPECIFIED	MACHINE PARTS SURFACE 125	TOLER FRAC ± DEC ± .005	DO NOT SCALE USE SPEC DIM.		DWG. NO.


8300-23
UART
AY-3-1015
ADRF
ADRE
ADRD
ADRC
ADRB
ADRA
ADR9
ADR8
MEMORY/
ADAT 7
ADAT 6
ADAT 5
ADAT 4
ADAT 3
ADAT 2
ADAT 1
ADAT 0
LSTROBE
WRITE/
READ/
EXT CLK
EXT DRR
ERROR
EIA TX DATA
20 mA TX DATA
EIA RX DATA
20 mA RX DATA
DEVICE READY
DATA STROBE
END OF RECORD
END OF FILE
DRI
DR2
DECOUPLING CAPACITORS - 0.1UF
C2, C3, C4, C7-C9, C11-C18,
C23-C28, C32, C35 C37,
C41-C43, C45
GATE | # | TYPE | PIN | + 5 | GND | | SP
M11, M85, M105 | 3 | 74LS00 | 14 | 14 | 7 | |
M12, M74 | 2 | 74LS02 | 14 | 14 | 7 | |
M15, 35, 75, 305, 307, 311 | 6 | 74LS04 | 14 | 14 | 7 | |
M60, 300-4, 308, 309, 310 | 9 | 74LS05 | 14 | 11 | 7 | |
M102, M104 | 2 | 7408 | 14 | 11 | 7 | |
M13, M75, M205 | 3 | 74LS32 | 14 | 13 | 7 | |
M70, M80, M203 | 3 | 7437 | 13 | 14 | 7 | |
M50, M306 | 2 | 74LS42 | 16 | K | 8 | |
M14, 45, 93, 95 | 8 | 74LS74 | 14 | 14 | 7 | |
M71, 72, 81, 82, 204 | 5 | 74LS86 | 14 | 14 | 7 | |
M25 | 1 | 74121 | 14 | 14 | 7 | |
M61 | 1 | 74LS136 | 14 | 14 | 7 | |
M10, M84 | 2 | 74LS367 | 16 | K | 8 | |
M40, M41 | 2 | 74LS373 | 20 | 20 | K | |
M92, M312 | 2 | 556 | 14 | 14 | 7 | |
M20, M30 | 2 | 8216 | 16 | K | 8 | |
M51 | 1 | 8255 | 24 | 24 | 12 | |
M202 | 1 | 8T15 | 8 | | | |
M201 | 1 | 8T16 | 14 | 14 | 7 | |
M100, M200 | 2 | TIL-117 | 6 | — | — | |
M31 (UART) | 1 | AY-3-1015 | 40 | 1 | 3 | |
M94 | 1 | 74123 | 16 | 16 | 8 | |
M83, M103 | | SPARE | | | | |
M44 | 1 | 6336-1 | | | | |
5G
KAYE INSTRUMENTS
PART PROTRACK AUX I/O
DO NOT SCALE USE SPEC. DIM.



KAYE INSTRUMENTS

DWN. BRW DATE 6-27-78
CKD. DATE
APVD. DATE

NO. REVISION DWN. DATE CHK. DATE

PART RAMP/PROCESSOR CONTROL CIRCUIT DIAGRAM

DWG. NO. C9200-33 REV. 0